THE SCIENCE
AND THE
ART OF TEACHING

LA RUE

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LA RUE'S SCI. AND ART OF TEACH.
W. P. 2

A FIRST WORD TO THE READER

For some years, the substance of this book has been used by the author to introduce students to the work of teaching. The modern teacher is the social parent of his pupil. As such, he must have some vision of the whole great work of education, but from the teacher's standpoint. Such a general view is here presented.

Emphasis is laid on the fact that teaching is becoming an efficient art, because we are learning to base it on scientific certainty, on the results of schoolroom experiment. The day of tradition and of merely personal authority has not altogether gone in education, but we can all help to speed its passing. Not only are the scientific spirit and ways of working emphasized, but teaching method is shown to be based on scientific method as found in the field and in the laboratory.

Also emphasized in these pages is the necessity for adapting the lesson to the learner. It is easy to give too much attention to subject matter. We are teaching children rather than branches of study, developing the mind rather than the matter. The child is made centrally prominent.

Aside from material equipment, four factors determine the success of our educational efforts. They are (1) the child, (2) the teacher, (3) the world, especially as represented in the "course of study," and (4) the educational ideal. In Part One, which is introductory, these four topics are discussed in a general way; and each of the four remaining

Parts of the book is devoted to the teaching process as dependent on one of these four factors.

Students who have had no introductory work in psychology will find the book adapted to them. Those who have had such an introduction are usually grateful for a review of the essentials.

I am greatly indebted to Professors W. L. Gooding of Dickinson College, and R. M. Yerkes of Harvard University, and especially to my wife, Mabel Guinnip La Rue, all of whom have read the manuscript and improved it much by their numerous and valuable suggestions.

DANIEL WOLFORD LA RUE.

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PART ONE

NATURE OF TEACHING: METHOD AND WHAT DETERMINES IT

CHAPTER I

OUR ATTITUDE TOWARD TEACHING

"This spirit seeks only the fact, without the slightest regard to consequences; any twisting or obscuring of the fact to accommodate it to a preconceived theory, hope, or wish, any tampering with the actual result of investigation, is the unpardonable sin. It is a spirit at once humble and dauntless, patient of details, drawing indeed no distinction between great and small, but only between true and false; passionless but energetic, venturing into pathless wastes to bring back a fact, caring only for truth, candid as a still lake, expectant, unfettered, and tireless.

> "'Work of his hand
> He nor commends nor grieves:
> Pleads for itself the fact;
> As unrepenting nature leaves
> Her every act.'"*

Exercise.—A parent asks me to tell him the best method for his child to use in committing to memory a poem of moderate length. I advise that the child learn thoroughly one line at a time, instead of taking one stanza at a time, or the whole piece as a unit. Am I right? How do you know? How can such things be found out?

You are going to teach. Naturally, you want to succeed. But whether you succeed or fail depends greatly on the regard you have for your work, your *attitude* toward teaching.

Every superintendent has to deal with teachers of various

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* Charles William Eliot, *Educational Reform*. Used by permission of The Century Company, publishers.

types: the salary-seeker, who, by keeping his eye on pay day, manages to pull through; the chore-boy teacher, who contrives, by much pottering, to use up all the time there is; the motion-maker, who feels that the whole business is guesswork so far as he is concerned, but who thinks the results *ought* to be there because he has worked hard, going through with everything the book and the superintendent told him to do. The teacher desired most of all is the scientific mind-maker, who, realizing that education, like everything else, is "governed by law," tries to learn that law and to follow its leading.

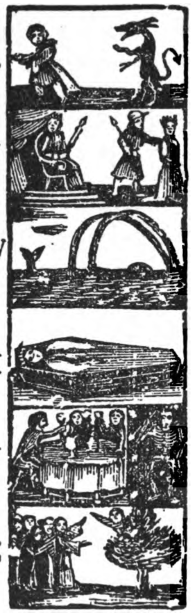
Science as the key to success.—Not individuals only, but the whole race is coming to regard science as the key to success. The farmer, the physician, and the business man, who used to follow blindly the practice of their predecessors, or groped along under the guidance of their own guesses, are finding that science unlocks for them the gates of enterprise. "Knowledge is power." A comparison of the *New England Primer* with a first reader of modern make (see pages 14 and 15) is suggestive of what has been accomplished in education.

When old means and methods fail us, we seek better ones, for we are engaged in a life-and-death game with the forces of our environment. Nature is often represented as a kindly mother, but she may also be pictured as a cruel stepmother. Whether we like it or not, our old Earth Mother deluges us with water, prostrates us with sunstrokes, poisons us with animal or plant venom, cracks our bones, swallows us up alive. But with all this terrible cruelty, she has her virtues; she is fairly regular in her habits, is invariably systematic and orderly. This is our only hope; by watching her carefully, we learn to foresee her opera-

tions and save ourselves by planning ahead. So we have learned to store our food for the winter that is months away, but which is sure to come. So most of us endure vaccination, to escape the disease which would otherwise endanger our lives.

Science aims at (1) prediction and (2) control.—Some of nature's doings are still a blank mystery to us. No one can predict when the next earthquake will come, nor can he control it when it occurs. Neither can we control storms, but, failing in that, we are learning to foretell their coming and take to cover. "Forewarned is forearmed." Further, in many cases we not only know what nature will do, but we even obtain control of some of her operations, her fires, electric currents, waterfalls, and the like, and make them work for us.

Now education is just a matter of preparing a child to go out into the world and play a winning game with nature (and human nature). As teachers, we want to control the child's attention, memory, thought, and behavior, until he can take the steering wheel and guide himself; and instead of tinkering blindly at his personality, we should be able to foresee just how his mind will operate when we apply the electric spark of education. The physician, after his diagnosis of a case, can give some "prognosis" of it, can tell what its future would be under various kinds of treatment. Some day, we teachers may be able to tell how our cases will turn out under our educational prescription. If ever we find out how to diagnose a pupil's personality and administer the kind of education that will yield him the most usefulness and happiness, whether as merchant, mechanic, or professional man, it will be the greatest educational discovery ever known.



T Young TIMOTHY
Learnt ſin to fly.

U VASTHI for Pride,
Was ſet aſide.

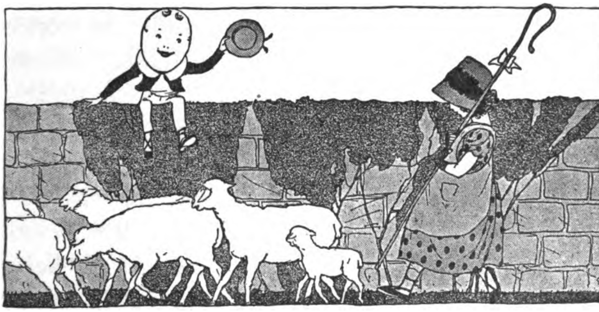
W Whales in the Sea,
GOD's Voice obey.

X XERXES did die,
And ſo muſt I.

Y While youth do chear
Death may be near.

Z ZACCHEUS he
Did climb the Tree
Our Lord to ſee.

A page of the *New England Primer*
(Exact size)
From the edition published by Mr. Ira Webster,
of Hartford, in the year 1843



She went to Humpty Dumpty.

"Please, Humpty Dumpty,
help me find my sheep!"

Humpty Dumpty sat on a wall.

Humpty Dumpty said,
"Leave them alone,
and they'll come home."

Page from *Story Hour Readers*
(Reduced one-fourth)

Why science succeeds.—The reason why scientific practice is crowding out other methods of work is because it excels in power of prediction and control. And the reason why it thus excels is because of its invincible method of finding out the truth. Since this scientific method is the basis of many of the methods used in the schoolroom, we should cultivate a warm acquaintance with it at once.

An example of scientific investigation.—Suppose the problem is to find the cause of dew.* First we must know exactly what it is we are trying to accomplish: we must know precisely what we mean by *dew*. Shall it include the moisture found sometimes on the outside of a pitcher, or on windows, or on water pipes? These cases are so much alike that it is probably best to consider them all together. By *dew*, then, we shall mean the moisture that gathers on any substance exposed in the open air, when there is no rain or other apparent source for the dampness.

Our second step is to get all possible facts in the case. We make many observations and experiments, consuming, it may be, weeks or months in the process. We find, time after time, that dew appears on objects which are under cover, such as the water pipe or the pitcher; that it may form on the under, as well as the upper surface of an object; that there is no dew on very cloudy nights; that if we forget to put up our carriage top dew may form on the seat, whereas, if the top is up the cushion is likely to remain dry; that dew gathers on substances which are dry inside, as well as on those that are damp, etc.

Having collected a goodly treasury of facts that seem to have some bearing on the answer to our question, we next

* For a more technical logical discussion of this investigation, see John Stuart Mill, *A System of Logic*, Bk. III, Ch. IX, § 3.

generalize, tie up our facts in bunches, so to speak, as the gardener does his radishes. For example, we may find that we have a hundred observations, all tending to show that *dew forms most freely on clear nights*. This generalization enables us to hold these hundred facts in a single mental grasp, and to place them as we please, without scattering our thoughts.

We now make guesses, *hypotheses* as they are called, as to the probable cause of dew. Let us see what some of them are:

1. Dew may fall from the sky, as rain does. But this cannot be true, for it was found that clear nights brought more dew than cloudy ones. Also, dew formed on our water pitcher, under cover, where anything like rain was out of the question.

2. Dew may be forced out of the object on which it forms. Perhaps the water on the pitcher came through the glass. But on looking over the facts we find that dew forms on objects that are dry through and through. We may even repeat some of our experiments, to make sure of the matter.

3. Dew may come from the air and settle on objects. But why does it not form on all objects all the time? We recall the coldness of bedewed objects as compared with the temperature of the surrounding air; we know that cold contracts most things,—why may it not contract the air and squeeze out the moisture, which then settles on whatever is near? We now have a theory that harmonizes all the facts: the cooling of moist air by a comparatively cold object squeezes out particles of moisture somewhat as if from a sponge; these particles unite to form drops on the object. We should not expect, then, to find dew on objects

that are warmer than the air, nor on any object surrounded by perfectly dry air.

We experiment further and find that this third hypothesis holds good under every test that our ingenuity can devise. So long as it continues to do so we shall accept it as "true."

Finally, having established this new truth, we feel safe to use it as a basis for further reasoning. For example, we may be asked if there could be dew were there no air; whether there is dew on the moon, etc. Having learned the cause of dew, we can reason out pretty certain answers to such questions.

Steps in scientific method.—While we have not gone into all the minute details of the investigation, we have followed, in general outline, the method used everywhere in science. We may sum up the steps as below:

1. Finding a definite question to answer.
2. Collecting instances, facts that seem likely to have something to do with the answer.
3. Putting these facts into a class, or classes, and finding what can be said of them; that is, generalizing.
4. Making guesses, hypotheses, based on the facts, suggesting possible explanations.
5. Testing to see which hypothesis (if any) is the true one.
6. Using the new truth as a basis for further reasoning.

The steps need not be taken in just this order: one may have a pretty definite hypothesis when he begins the collecting of facts. Also, the scientist is sometimes compelled to halt before the process is finished. For example, he may make some important generalization, such as "All magnets attract iron but not wood," without being able to complete his work and show why this is so. But the steps enumerated above are the essential processes in scientific investigation.

The scientific spirit in education.—Most noticeable in the scientific spirit is that it takes nobody's statement as the source of authority, but "seeks only the fact," insists that the voice of the facts shall silence all other voices. It forbids us to worship educational heroes and blindly obey them, or to do what "has always been done," when the facts in the case condemn such practice.

Further, these facts are obtained for the most part, not by stumbling against them in the darkness of random experience, but under the searchlight of carefully planned observation, accurately recorded. It is this devotion to scientific method that has built up our "experimental pedagogy," and much of what is known as educational psychology. The scientific educator demands that so far as possible all questions be settled, not by wrangling argument, nor by appeal to personal authority, but by experiment. He believes that not nature only, but human nature as well is regular in its workings, is "subject to law," as we say, and that its laws can be worked out, slowly, with many sighs perhaps, but surely. Pedagogy needs more investigators who will study the minds and bodies of children as keenly as others are studying the wings of moths and the mandibles of ants.

If you take the scientific attitude toward teaching, you will realize that there is among teachers a great deal of fiction which is passing as truth. You will learn to distinguish the earnest truth seeker from the mere opinion peddler. You will learn that you cannot develop souls by a blueprint pattern furnished from the superintendent's office, but must have some insight yourself. You ~~will be fearless~~, but tolerant of others; for the field of truth is too large to permit of monopoly. You will be critical, not for the sake

of the criticism but for the sake of truth. You will not make believe; and if others do so, you will prick their bubbles with your logic. But you will not aim to win debates merely. Whether you confute another or acknowledge your own error, it will all be done in the same calm and happy spirit. Let facts be facts, whatever the consequences.

FOR FURTHER STUDY

1. What are the dangers of following blindly an educational leader?

2. Choose some thoroughly scientific person of your acquaintance and describe his attitude toward his work. Do you think he would quickly accept a new theory, or substitute authority in place of scientific investigation?

3. How does the position of school principal or superintendent differ from that of manager of a gang of laborers?

4. Devise an experiment to determine whether children should recite spelling orally, or by writing, or both.

5. Let each member of the class bring in one or more examples of a collection of something, such as coins or stamps, made by a child. See if any generalizations can be made, and whether such collections can be satisfactorily explained.

6. Do you think your mind is "governed by law"? Can you state any mental law? Where can you find statements of mental laws?

7. Should we ever argue educational questions, if they are open to harmless experiment? What kind of question should be debated?

8. Look up and report an account of an educational experiment.

9. When you prove something of one triangle, is it sure to hold true of all triangles? Why? If you prove some-

thing about one child, is it sure to hold true of all children? Why?

10. Describe a pet or a friend, as you would for rhetorical purposes, and then give a scientific description of the same subject. What is the difference? Which appeals more to thought? To feeling?

11. Generalize about your school: make statements that will hold true of all the students; all the faculty; all subjects studied; all athletic sports.

12. Can you think of any outworn practices in schools, which you would like to change? How can you tell whether the change you propose would be wise?

REFERENCES

Boone, Richard Gause, *Science of Education*, Chs. XIII, XIV.

O'Shea, M. V., *Education as Adjustment*, Chs. I, II.

Rusk, Robert R., *Introduction to Experimental Education*, Ch. I.

Yerkes, Robert M., *Introduction to Psychology*, Ch. XXX.

Journal of Educational Psychology.

CHAPTER II

THE SCIENCE AND THE ART OF TEACHING

"A science teaches us to know and an art to do, and all the more perfect sciences lead to the creation of corresponding useful arts." *

EXERCISES.—(1) Toss a coin fifty times, recording the number of "heads" and of "tails." Repeat until you feel that you can state the law of the appearance of heads and tails.

(2) State in advance how many heads and how many tails you expect to get if you toss fifty times more. Try it.

(3) Number the next twenty-five throws and place opposite each number an *h* for head or a *t* for tail, according to what you expect in each case. Try it.

With which did you succeed better, (2) or (3)? Can you tell why?

It is not to be expected that every teacher will immediately plunge into educational experiment on a large scale; but we can all appreciate and use the results mined out for us by others. We may even gain the chance to coöperate in such work, and so have a right to feel that we are of real service in creating a reliable science of education.

What kind of science can we hope to establish?

Sciences are either exact or approximate.—We have found that science is seeking the power to predict and to control. A science is exact, then, in so far as it can (a)

* W. Stanley Jevons, *Elementary Lessons in Logic*. Used by permission of The Macmillan Company, publishers.

predict events accurately, or (b) control them minutely. The astronomer can predict the uncontrollable movements of the heavenly bodies—say an eclipse—to the fraction of a second. Hence astronomy is an exact science. On the other hand we have learned to accept with some indulgence the predictions of the weather bureau: meteorology is not yet an exact science. Power of control is highly developed in physics and mechanics, while it is all too slowly coming into our grasp in such sciences as agriculture, medicine, and education.

Education can be an approximate science.—The reason why some sciences cannot be exact is that there are so many unseen forces at work; we fail to read what is going on behind nature's countenance. The weather cannot now be predicted precisely, because we have not as yet been able to isolate and measure every factor, cloud, wind, and what not, that affects weather conditions. So with the science of teaching: to attempt to measure accurately all the currents of a child's mind is much like trying to measure all the petty tributaries of a river, when they have mingled well in the big stream, or the many minute and constantly changing parts of the flame of a candle. Besides, the child's mind is unstable; one little electric twinkle in the corner of the teacher's eye may destroy the whole value of an educational experiment. Such a twinkle would have no effect if one were experimenting on a piece of steel.

To meet such difficulties the investigator depends upon spreading his work out, and covering enough ground *roughly* to make up for his lack of accurate knowledge of any one square yard of it. He barely touches a great many things, and can predict little, if at all, about any particular object we may point to. Such would be the experiment

of raising five thousand hills of potatoes on an acre: the farmer cannot safely predict the future of any individual hill, but he can tell, *in the long run*, the average yield to expect from an acre, or even from the average hill of potatoes. So also the teacher, by collecting statistics from large classes year after year, can tell about how many pupils in a hundred are likely to make a satisfactory mark, and how many are likely to fail. But he cannot foretell, when first he meets a hundred new pupils, precisely who will win the highest marks, and who will not pass.

Most of our results, then, apply to large groups only, not to any one pupil in particular. For example, suppose one group of a hundred children learn the spelling lessons by writing the words over and over, while another group learn the same words more quickly and lastingly, by having them placed on the board and making a mental picture of each, after its erasure. This would convince most of us that the second method is better than the first in teaching such *groups* of pupils. But if we were tutoring any individual child of the two hundred mentioned above, we could not be sure that we had the superior method for *him*, since some few learn better by the method of repeated writing.

We can appreciate the situation if we recall how accurately a marksman can direct and control the course of his bullet; how the astronomer can foretell, to a second, when the sun will rise on any day we may name for him, ten years from now; and how helpless the teacher is either to predict or to control the career of the next pupil brought to him to be educated. But our disadvantage is not hopeless. We are making constant progress in the direction and control of pupils' lives.

Teaching is an art, as well as a science.—In any undertaking, science is the brain and art the hand. "A science teaches us to know and an art to do." An art is a *process*, the process of changing some kind of raw material into a finished product. In teaching, the "raw material" is our pupils as they come to us; the finished product, these pupils when they leave us. If they have not undergone a real change for the better during their sojourn with us, we can hardly say we have taught at all, no matter what fine performances we have gone through in the schoolroom. We do not teach unless somebody learns.

The science of teaching should enlighten the art.—Just as there are good farmers who do not understand their own farming, so there are successful teachers who can explain neither what they do nor why they do it. But they are in danger of being like the quack, who, because a pink pill cures one case, administers pink pills to all patients for all ailments. Silly as this may seem, such teaching is equally absurd.

Nowadays, however, every art that hopes to maintain its standing seeks scientific guidance. As the best farmer is the well-informed agricultural artist, and the best physician is the scientific practitioner, so the best teacher is the one who compasses both his science and his art, who uses both head and hand. Thoughtful art is applied science.

The relation of education to other sciences.—Education is the little brother among sciences, and it would be foolish not to profit by what its older relatives have accomplished. All are working for the same general purpose, to find out the truth about ourselves and the world in which we live. We can learn much by keeping an eye on what our neighbor is

doing in his field of investigation, while our hands are driving our own work.

Some of our nearest and most helpful neighbors are: the biologist, who attempts to explain the mystery of life; the physiologist, who shows us what each part of the body does for the body as a whole,—the work of heart, stomach, and nerve; the sociologist, who shows us what each part of the social body does for the people as a whole,—the work of school, church, government; the psychologist, who is meeting with some success in exploring the mazes of the mind. All these and many others labor alongside the educator in a spirit of cheerful coöperation.

The teacher cannot be a specialist in all these fields. But he can reasonably hope to cull from them some of the facts that are largest, most significant, most illuminating for his educational endeavors. This shall be one of the aims in the pages that follow.

FOR FURTHER STUDY

1. Should you, as a teacher, prefer to receive detailed instructions intended to apply to every child, or to take the responsibility of treating each as you think fit? Why?

2. A superintendent in one of our large cities laid out the daily geography lessons for each grade. Was this wise?

3. How many students have been graduated from your school each year of the past ten years? Does the average tell you the number that will be graduated this year? Is the average likely to remain the same for the next ten years? How does this problem differ from that of foretelling the percentage of stormy days during the next year or the next ten years?

4. It was once thought that, since the ocean became warmer the farther south one went, at the equator the

water must boil. Explain the nature of this error. Is there any danger of similar errors in pedagogy?

5. On automatic weighing machines, figures are often found stating "what you should weigh," according to your sex and height. What authority is back of these figures? Is there any reason why they should apply to you individually?

6. Physical culturists often speak of "perfect" physical development: what is this? Whence do they obtain their idea of perfection? Have they a right to apply it to you? Why?

7. Binet found that the average height of ten-year-old French boys was 130 centimeters, and their average weight 28 kilograms. Should a French boy whose tenth-year height and weight fell below these figures be classed as subnormal? Why?

8. What is a norm? Should teeth that are as healthy as the average be called normal? When should the norm be an average? When an ideal?

9. Shall we ever be able to forecast the length of a human life scientifically? Why?

10. Can you suggest any educational questions that are not open to experiment?

11. Resolved: That a teacher who has learned by experience the art of teaching, but little of the science, is to be preferred to a normal or college graduate who has learned the science but not the art. Choose your side of this question and outline an argument.

12. How do you find whether it is wrong to lie? To steal? Would you advocate experiment here?

13. Galton found that the head of a certain child who had measles and other children's diseases ceased to grow during illness, and never recovered the lost growth. What do you think of the probability that this would hold true for all children?

14. Which can safely be applied more widely, physical or mental statistics? Why?

15. Who decides what we should try to make of our children finally? How should this be decided?

16. Consider the comparative value of the following, as means of investigating any question:

1. Unsystematic observations or trials of a thing—"experience."
2. Statistics: systematic, extensive observation or experiment; partial knowledge or control (or both) of that which determines the result.
3. Intensive observation or experiment; comparatively full knowledge or control (or both) of that which determines the result.

Which is most reliable? Which has been most used in the investigation of educational questions?

REFERENCES

James, William, *Talks to Teachers*, I.

O'Shea, M. V., *Education as Adjustment*, Ch. III.

Rusk, Robert R., *Introduction to Experimental Education*, Ch. II.

Thorndike, Edward L., *Educational Psychology* (1903), Ch. XV.

CHAPTER III

METHOD AND WHAT DETERMINES IT

"Method is essential to the highest genius, whether it be in teaching or in other matters; and the results arrived at by clever men are largely due to the excellence of the method employed. 'If I have any advantage over other men,' says Descartes, 'I owe it to my method.'" *

Exercise.—Before reading this chapter, try to teach some one something you know,—how to whistle, throw a ball, make a paper doll, solve arithmetical problems, or the like.

Did you succeed? How do you know? How did you go about it, that is, what *method* did you use? Can you think of other methods that would bring the same result? How can you tell which is best? Make a list of the chief factors in the problem. What should determine the choice of the method to be used in any particular case?

Nature of method.—A *method*, according to the root meaning of the word, is a way of getting somewhere, attaining something we are after. It is an orderly procedure for the accomplishment of a definite end. As we can reach Rome by more than one road, so we can usually accomplish a given object in more than one way. These ways are methods. Physicians, for instance, have many ways, or methods of curing a patient. So with the farmer, who has different methods of crop raising; the cook, who knows

* Joseph Landon, *Principles and Practice of Teaching and Class Management.*

several recipes for making pie; and the teacher, who understands the various methods of "making" mind. In every case there is an orderly process for the accomplishment of a definite end.

What determines method?—Picture to yourself a mechanic at his bench. Here we have (1) the material to be shaped, (2) tools with which to shape it, (3) the mechanic who wields the tools, and (4) the ideal which he holds in his head as a pattern by which to work. The way he sets to work, that is, his *method*, depends on all four.

Similarly a teacher stands before his class. Here we have (1) the children, the material to be shaped; (2) branches of knowledge, the tools with which to work on the children; (3) the teacher who wields these tools; and (4) the ideal of the educated man or woman, which he holds in mind as a pattern. The mechanic's ideal is sometimes bodied forth on paper; and the teacher is fortunate if he can find a few admirable people about the community, to serve as concrete models. At any rate, the way he sets to work, that is, his *method*, depends upon these four factors, which are present wherever a teacher plies his art.

Some axioms for the teacher.—If we have succeeded in finding the four chief determiners of method, then there are certain important truths which force themselves upon us at this point, and which seem so nearly "self-evident" as almost to take the nature of axioms.

1. *The teacher should know the child.* Bear it ever in mind that you are to teach children, rather than branches of study. Many teachers in their zeal to master subject matter forget this. As a result the human interest is lost from their work, and we hear the clatter of the educational machinery. As a meal is prepared for the eater of it, rather

than for the chef or the waiter or even the whole culinary system of the kitchen, so all educational endeavor is neither for the teacher, the superintendent, the school board, nor the whole school system, but for the child. Take him away, and the whole structure would collapse.

There is much danger of assuming blindly that we can understand children without study; or that they are just what we were when children; or that they are manikins, that is, like adults only smaller; or that they are all alike, and hence like some one child whom we know intimately; or that we can at least get the necessary knowledge of them from books. All these assumptions are wrong. We should look upon the child without prejudice or presumption, as we regard a tree or a toad: he is a natural object for scientific study. But let us add quickly that he belongs not only in the realm of nature, but in that of *human* nature as well, and hence is an object for *sympathetic* study. However much else we may know, it is only after such study of those who are to be taught, that we are prepared to teach.

2. *The teacher should know the world*. We have seen that the various branches of study constitute the teacher's kit of tools, the educational implements with which he works on the child. But they are toy tools in a way, for each is a reduced copy of something greater which is found outside of school. For example, school geography is but a miniature of the actual geography of the world outside. School work then is largely a substitute for something more "real," namely contact with the persons, places, and affairs of our whole vast environment.

As most children cannot learn geography by extended travel, they must do the best they can with books, pictures, and models. As they have no actual dealings that involve

the computing of interest and discount, other people's problems are thrust upon them for solution. Speaking generally, the less representative and artificial the school problems are, and the more the school is like the kind of world children *should* live in, the better the resulting education.

The teacher must know the curriculum; but if this is all he knows, if he has not touched the larger and more real world through business or travel or some other kind of social intercourse, or if he knows it only through the touch of polite society, both he and his pupils are unfortunate.

3. *The teacher should know himself.* The average person needs an introduction to himself; for few study themselves sufficiently to become acquainted with their own personalities. Many teachers of scholarly ambition are failing because they have neglected one study, self-study. One should know both his strong and his weak points, physical and mental. Before entering a vocation, he should take an inventory of his abilities and the demands of the vocation, and see how they compare.

Having become a teacher, follow the lead of your greatest successes. Find the method *you* can use best, both inside and outside the schoolroom. Learn just what kind of working force you naturally are, and whether your personality is such as to produce the good effect you intend. There is room for all to succeed, if only each can find the place where his inner forces can expend themselves with greatest freedom.

4. *The teacher should know the educational ideal.* This is the star to which we hitch our wagon. What is the child to be and do, both as child and adult? As the architect has in his mind an ideal building, so should the teacher picture for

himself an ideal personality. Not that the teacher aims to make all his pupils alike, any more than the architect aims to make all his buildings alike. It would become unbearably monotonous if one found himself the exact duplicate of every person he met!

It is not enough, however, to know the ideal as one knows the multiplication table: he must live it as he lives his songs and prayers. Strange to say, the most nearly perfect man seems to be one who is conscious of his imperfections and is ever trying to rid himself of them. In this sense, the teacher should be perfect. Best of all is the teacher who may well be described as *aspiring*, who has conceived a great purpose and who daily endeavors to accomplish it.

Nevertheless it is the child himself who furnishes the ideal for his own education, as the rose furnishes the ideal for its own development. As we cannot change the rose into anything contrary to its nature, neither can we develop from a child anything that his natural constitution has not made possible. The strong-minded teacher who attempts to stamp himself upon the child instead of developing that child's personality may be the worst of all teachers.

FOR FURTHER STUDY

1. Which is more important, a good teacher or a good curriculum? Why?

2. State the relation of general, to special methods.

3. Suppose yourself a member of a board of education: what should then be your largest questions? What do you think most interests a superintendent of schools? A teacher?

4. Make a list of several methods of teaching a child tc read. Would you use the method by which you were taught? Why?

5. Education has been called the problem of the three M's, Man, Matter, and Method. Criticize this.

6. Do you know of any cases where a child's welfare is being sacrificed to a system or a false ideal? If so, describe some of them.

7. How can the following two statements be harmonized? (a) The more the school is like the world, the better the education. (b) When an individual is educated by direct contact with the world, his education is likely to be patchy, unsystematic, and incomplete.

8. Why need the teacher have an educational ideal, if each child has an inborn ideal into which he is developing?

9. Should a father map out a definite career for his infant son? Why?

10. Galton states that parents and children usually "understand the ways of one another more intimately than is possible to persons not of the same blood, and the child instinctively assimilates the habits and ways of thought of its parents." If this is true, comment on the value of home teaching as compared with that of the school.

11. In the same connection, Galton says: "Those teachings that conform to the natural aptitudes of the child leave much more enduring marks than others." In the light of this, which are likely to be the most valuable branches for a child? How can we discover which they are?

12. State your ideal of manhood or womanhood. How came you by this ideal?

13. Describe yourself as you would like to be at the age of forty or fifty.

14. Describe the best teacher you have ever had.

15. In order to "know the world," need one be experienced in all its evil?

16. Give original illustrations of *principle*, *law*, *system*, *method*, *rule*, *device*. Define each, making use of the dictionary if necessary. Work out the relation of *method* to the other terms.

17. Try to state the rule for whistling, without going through the act. Ask a good swimmer to tell you, when he is out of water, exactly how he swims. What do your results show?

18. Should we take it for granted that one who can do a thing well can therefore teach it well? Does ability to quote rules prove the ability to perform the corresponding operations? Give instances to prove your answer.

19. Young teachers usually wish to be told many devices, while those who teach them generally regard laws and principles as of first importance. Which is right? Can you think of any way of satisfying both sides?

REFERENCES

Bagley, William Chandler, *The Educative Process*, Ch. I.

Bolton, Frederick Elmer, *Principles of Education*, Ch. I.

Dewey, John, *My Pedagogic Creed*, Article IV.

Pyle, William Henry, *Outlines of Educational Psychology*, Ch. I.

Strayer, George Drayton, *Brief Course in the Teaching Process*, Ch. II.

CHAPTER IV

THE EDUCATIONAL IDEAL

"Both in school and college, diversity, not uniformity of product should be the aim. The fortunate pupil or student is he who early discerns his life career, and makes his school training or his school and college training an appropriate preparation for it. The vocation once known gives clear guidance to those knowledges and skills which will best contribute to success in it." *

Exercise.—Which would you prefer to be, an uncivilized Indian with fine health and a strong probability of living to the age of seventy, or a well-educated white, doomed to die of tuberculosis at forty-five? Why?

We have found that the first step in scientific procedure consists in forming a clear idea as to just what we are trying to do. Indeed that should be the first step in every enterprise. When we undertake the education of children, then, we must first try to get a clear conception of the educational ideal.

Nothing receives more attention in theory, or less in practice, than the aim or purpose of education. But the pilot cannot box the compass in port and then stow it away during the voyage. He steers with his eye ever on the needle and the star. So our ideal in teaching should be kept so constantly before us that its light will illumine every league of our course. "Just what am I trying to ac-

* Charles William Eliot, *The Value During Education of the Life-Career Motive.*

complish now?" "What is the use of this?" "What am I here for, anyway?" These are the questions the teacher should ask himself over and over. To set sail without chart or compass is worse than to lie at anchor in the harbor.

Education as change for the better.—We are trying to change the children; that much is certain. If education makes no difference, of what advantage is it? If we could subtract an uneducated boy from the same boy when he has become educated, the remainder would give the value of education, and indicate what it is we are trying to "add" to our pupils. Let us consider other instances, among objects, plants, and the lower animals, where there is change in the way of betterment, and find whether this helps us when we apply the idea to children.

The sap of certain trees, when subjected to heat, makes rubber; but raw rubber of this kind loses its elasticity when exposed to the air. Crude rubber can be so changed by a certain method of treating it with sulphur, that it will remain elastic, and it becomes more pliable, plastic, and durable. We thus develop the rubber, according to its own nature, so as to make it more useful. This seems like education. The rubber is graduated from the factory and receives its diploma in the form of the manufacturer's stamp.

Similarly, when we develop a young cabbage plant in the garden, all we can do is to bring out the traits of the cabbage. No one can change it into a cauliflower. We "educate" it by developing it, according to its own nature, in the direction of greatest usefulness.

Canary birds are trained to expert singing by giving them a graded course in tone production. They imitate sweet-sounding bells, the resonant violin, the cultivated

human voice, and the trills of their more advanced classmates. When they are graduated from this canary conservatory, they go out as certified singers.

Wherever man works changes, in cooking food, raising vegetables, training dogs and horses, or educating children, his purpose is the same: to develop each, according to its nature, so as to make it most useful.

To whom is the child useful?—In dealing with plants and the lower animals, we sacrifice them recklessly for our pleasure. We witness without a shudder the wanton beheading of a carnation, and some of us can swallow a live oyster, or boil a living lobster, without compunction. But the closer we come to our sensitive selves, the more sympathetic we grow; we never boil a live lamb. And though we train horses to serve us, we no longer permit them to be abused. These higher creatures have minds somewhat like our own. We realize that they are to some extent sharers of our common life, and therefore should not be made mere means to our pleasure, but have some right to their own career of life, liberty, and the pursuit of happiness. They are of use to *themselves*.

This is emphatically the case with the precious little animals called children. A wit has described education as a means of defense against the rising generation. But if we seriously wished to do so, we could keep our children in the toils as we do our horses, could subdue them all as effectively. No; we wish to develop each member of this rising generation according to his own nature, so as to make him most useful to *himself*,—and to others like him, his fellow men.

We ought, then, to discover some very practical truths about the aim of education, by considering what our parents

and teachers did for us. Certainly we do not wish that they had tried to make us all over according to their own arbitrary ideas. We can see that the only wise way was for them to accept us as nature formed us and make the most of the material, working along the lines nature laid down for us. Whether we were large or little, of great intellect or small, two-talent or ten-talent children, the only sensible thing for them to do was to develop us according to our own nature, in such a way as to make us most useful to ourselves and our fellow men.

What the next generation expects from us.—There seem to be three weighty questions which we may well ask of our parents and teachers, and which each member of the rising generation (when it has risen) will put to us:

1. "Have you given me *health* and the knowledge of how to care for it?"

2. "Did you teach me *morality*, the art of living with my fellow men?"

3. "Did you study my personal traits, my tastes, abilities, talents, aptitudes, tendencies, and help me to find the kind of life, the *vocation*, in which I could be most useful and happy?"

These three questions point to the fact that education is of three essential kinds, physical, moral (or social), and vocational.*

Physical education.—It is just as impossible to have a good mind without a good brain, as it is to have a good electric current without a good dynamo. But this good brain must be nourished by an abundance of rich, red blood;

* These three kinds of education overlap somewhat. For instance, morality demands that one keep himself healthy if he mingles with others. But their overlappings only emphasize what is most essential.

and such a blood stream is found only in a body whose organs do their duty. Great muscular strength is not necessary, but health is. The giant-minded invalid is a rare exception. Physical education constitutes the very corner stone of a good education.

Moral education.—It would profit us little if, having learned to be healthy and intelligent animals, we fell to and destroyed each other; or if our passions were so rampant as to ruin our whole future through present recklessness and barbaric debauchery. We must learn sometimes to sacrifice a present satisfaction for the sake of a greater one to come; and to subordinate our personal selves, if necessary, that the *social* good may be increased. The art of conduct which we hope to teach to our pupils consists in so ordering private life and public business as to achieve the maximum of good for all.

Vocational education.—Moral education furnishes merely guidance and control, not the fire, the drive, the force to be controlled. It is the track, and not the engine. For individual motive power we must look largely to vocational purpose.

Unfortunately, the term "vocational" is often used as if it meant "industrial," or "manual," or "wage-earning." One's vocation is his calling, be it preaching, fishing, or nailing on horseshoes. It should be one's inherent life purpose, what his Creator apparently made him for, what his talents fit him for, what he can do best, his opportunity not merely to gain money or reputation but to serve society. Right here should be the center drive of education, so far as the individual is concerned. We cannot insist too strongly on the primacy of vocational purpose. With some, this may mean nothing more than the procuring of

the daily bread and butter; but in most cases the earning of a living will be but one pleasant part of the living of a life.

What we expect from the next generation.—If the rising generation have a right to expect so much of us in these three directions, shall we not also expect much of them? When they arrived among us they found here a society of people pretty well organized, with all our social institutions, family, school, government, business, and the like, ready to serve them. Had they been born among Eskimos or Bushmen they would have opened their eyes on a very different environment. What we call their "social inheritance" would hardly have been worth quarreling about.

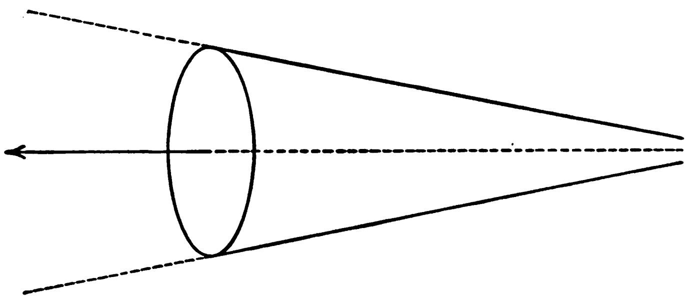
Herein lies the charm of such stories as *Robinson Crusoe*, and *The Man without a Country*: they make us see the awfulness of losing our social inheritance. To live without family, friends, church, library, news, daily occupation, and human coöperation and sympathy is almost to be entombed alive.

They who have received an education, having enjoyed such a goodly heritage, should aim to pass it on, not merely preserved intact, but enriched, increased. They are debtors who should pay their debt by serving society,—and society is all of us. Our educational ideal then is to develop each child, according to his nature, so as to make him most useful socially.

However, we must not regard the developing process as a dull and grievous period, to be endured only for the bright prospect of social usefulness later. Education is commonly thought of as "preparation for complete living." So it is; but the troublesome question arises, When does one attain to complete living? The child looks ever forward, the college graduate with equal eagerness expects a

larger life, the dying man cherishes as his fondest hope the vision of a life beyond that shall continue this fragmentary existence. Little children and rosebuds are both complete in their undeveloped way; both are doubtless all they were meant to be for the time. So life is at every stage complete, yet it is at every stage awaiting completion.

Development may be figured as a cone expanding without limit. The aim is not merely the last step of the journey, the final process in a series: it is present at all stages, even from the very beginning, as the law of life around



which all our activities are organized. Our aim is something which is being constantly realized, yet which draws us ever onward: it is development for greater usefulness.

The mischief of such an ideal as that of "preparation" is that it is likely to result in *deferred* living, the sacrifice of childhood as an unreal thing, to be utilized merely, possessing no ends of its own. So the college looks upon the preparatory school as *merely* preparatory; "real" education lies above and beyond. The high school has the same superior regard for the grammar school, and so on down. But we must not despise any stage of growth, nervously looking to the future as the only place where good is to be found. Every stage should be regarded as both an end in

itself and a preparation for what is to follow. The world is coming to believe that the best preparation for the future, whether an immediate or a far-away future, is hearty, happy, worthy living right here and now. If under ordinary circumstances we cannot make the present seem good, we are not likely to succeed much better with the future we long for.

What we all live for.—Every year of life, whether lived as cooing babe, or boy at school, or lover, or snowy-haired sage, should be worth living purely for its own sake. The end, the aim, the purpose of life, that which society as well as the individual lives for, is just life itself and ever more life. If it were mere brutish, animal life, we should not want it. No one would desire to be even the liveliest beast or sea serpent. Our yearning is for abundant soul life. Our deepest desire is, not only that we lose nothing of our present soul growth, but that we may constantly expect larger thinking and greater joys.

FOR FURTHER STUDY

1. How came you by your educational ideal?

2. State what you think must have been the educational ideals of some historical peoples, say the Greeks and Romans.

3. Will our educational ideals be apt to satisfy posterity a hundred years from now? Why?

4. State some differences between your social inheritance and that of your grandfather. Try to anticipate that of the grandchildren of the present generation.

5. Is it worth while to build an ideal which you think is impossible of realization? Why?

6. Who is likely to be more useful socially, one who

insists on spending his time with us, or one who works quietly for our welfare?

7. Give instances of reformers who have served society by defying and opposing it.

8. Does your ideal mean, for the most part, *having* things, or *being* and *doing?* Illustrate.

9. Should our purpose be to reduce the world to a state of standstill perfection? Or is it possible that there should be eternal progress, an ever-widening stream of good things?

10. Try to define what you mean by the word "culture." Does it mean the same as education?

11. Do you know any young people who regard education as a means of escaping the hard work which the uneducated will have to perform? What, then, if education were universal?

12. Can one develop according to his nature, if he is not allowed to choose his courses of study? What bearing has this on electives?

REFERENCES

Bagley, William Chandler, *The Educative Process*, Ch. III.

Dewey, John, *Ethical Principles Underlying Education*, pp. 1–15.

Eliot, Charles William, *Educational Reform*, Ch. XVIII.

——, "The Value during Education of the Life-career Motive;" *Proceedings of the National Education Association*, 1910, pp. 133–141.

O'Shea, M. V., *Education as Adjustment*, Chs. IV, V, VI.

Spencer, Herbert, *Education*.

Thorndike, Edward L., *Education*, Chs. I–III.

PART TWO

METHOD AS DETERMINED BY THE NATURE OF THE CHILD

CHAPTER V

PHYSICAL EDUCATION

"The crying need of the hour is to get educators to recognize the fundamental importance of all forms of physical training and bodily activity, as a basis for the cultivation of the higher mental and moral faculties." *

Exercises.—Keep a record of the time spent by some child (or children) in (1) physical and (2) mental activity during a day in school, and a corresponding record for the same length of time when there is freedom for independent choice of activity. If possible, compare a week or a month in school with the same period during a long vacation, and study a considerable number of children, to make the result more trustworthy.

Which provides the better program, the school or the children? Why?

Several investigators have found that there is usually an arrest or retardation of physical development during the first school year, and also that the death rate among children increases at this time.† What do you think causes this?

Purpose of physical education.—Let us recall the three kinds of education found necessary for all, physical, moral, and vocational. One may develop and train his body (1) for the sake of body, or (2) for moral and social reasons, or (3) for vocational purposes.

* Dudley A. Sargent, *Physical Education.* Used by permission of Ginn and Company, publishers.

† Robert R. Rusk, *Introduction to Experimental Education*, Ch. III.

(1) While it is no mean thing to possess a fine form, and to enjoy the powerful play of large, rolling muscles, yet the greatest physical strength and the greatest mental strength are not necessarily found in the same body. It is a mistake to regard the body as a seductive and tempting enemy, to be starved and ill-treated; it is equally a mistake to suppose that heavy athletics will of itself insure the development of a great mind or a weighty personality.

The body, then, should (1) furnish the basis, the support of mental life, and (2) serve as a vibrant, responsive instrument for the expression of mind, as the violin aids in creating and expressing its music.

(2) Physical culture has a direct effect on moral conduct. A successful digestive system and other internal organs are favorable to kindly feeling; and will finds a stable support in well-disciplined muscles and vigorous blood stream. No one whose habits of eating, sleeping, and exercising are very defective, is apt to remain thoroughly moral in other respects.

(3) Various vocations require many different physical qualities, such as size, strength, endurance, agility, skill, and grace. It is unfortunate that some of these, usually strength and endurance, are often demanded in such excess as to interfere with the mental life. Indeed, not even the highest degrees of strength, activity, and grace are ever found in the same individual. However, let each be developed "according to his nature"; there is abundant room for him who feels that he can serve society best by using his physical powers chiefly.

But a man's value is graded by (1) the moral tone, (2) the energy, and (3) the intelligence and skill which he can throw into his work. All these qualities abide chiefly in

the nervous system. Physical education, then, does not mean muscular education alone: we should work, first and foremost, for the development of the *best possible nervous system*.

Relation between muscular and nervous development.—In some of the lower forms of animal life the nerve cells are not joined to form a "system" at all, but are formed in isolation in various parts of the body, imbedded in muscle. One may almost say it is muscle that calls brain into existence; and throughout the animal kingdom there is a close relation between the two systems, nervous and muscular, in their development. The cells of the brain would remain forever asleep, inactive, were they not stimulated from without. If an infant's sense organs and muscles could be prevented from sending messages to his brain, he would never have enough mind to deserve the name.

Just how much of this waking-up process is due to the muscles we cannot tell, but it is certainly large. Puppies that are compelled to dig for their food develop larger and better brains than those which have their food thrown to them. Sargent found, during his four years' teaching at Yale University, that there never was a time when that division of his classes which ranked highest in scholarship did not stand first in the all-round work of the gymnasium.

In no way known to science can any difference be discovered between sensory brain cells, which have to do with our thinking, and motor cells, which guide our movements. Mosso believes that thought power and the power of muscular control reside in the very same cells. He asserts that "the more mobile the extremities of an animal are, the more intelligent it is." He points out also that many great artists were apprenticed to goldsmiths, under whom they

practiced fine handiwork. "I am convinced," he says, * that muscular movements have formed the omnipotence of genius."

Gulick reminds us that from one third to one half the brain surface is concerned in making muscles contract, but he says that "this does not prevent these parts of the brain from being used in other ways also." He thinks the motor brain may be a sort of battery for the other centers, but furnishing endurance rather than force.†

The conclusion is this: whenever we employ our muscles under the guidance of intelligence, we are either (1) waking up the very brain cells that do our thinking; or (2) we are improving the "batteries" on which these thinking cells depend for their efficiency. If the first is true, it furnishes one of the strongest of arguments for manual training and kindred arts. But in either case muscular activity, physical education of some kind, is indispensable.

Physical education should follow the order of muscular and nervous development.—The larger muscle groups develop first, with the consequence that the young child, instead of exercising isolated muscles, should be more of a unit of activity. First, the large muscles of the trunk should receive attention, then those of the limbs. The corresponding nerve centers develop in the same order. Nerve centers for the control of activities performed at birth are ready to function at birth. Says Gulick: "The motor centers for the control of the skeletal muscles develop in the order of their distance from the trunk; thus, shoulder before elbow,

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* Angelo Mosso, *Psychic Processes and Muscular Exercise*, pp. 383–407 of Clark University Decennial Celebration Volume, 1899.

† Luther H. Gulick, *Physical Education by Muscular Exercise*, p. 19. Used by permission of Blakiston and Sons, publishers.

elbow before wrist, wrist before fingers. . . . The interest the child shows in special forms of activity is an excellent guide to the order of development of the motor activities."

This author's words are so clarifying that it seems wise to quote him at greater length:

"This order of development of the nervous system is important with reference to educational gymnastics, because otherwise they are abnormal. Nothing but disaster can be expected if we attempt to force motor education out of its natural order. The education of any part is best done when that part is ripening. If this is accomplished, the part may be further perfected at any time during later life. If it is not accomplished, the part can never be made to reach its highest development by later education. The development of the motor areas for the trunk takes place during the first two or three years of life. The arms and legs are pretty well under control at the age of five or six. The interest of boys in marbles; in all forms of machinery; in throwing, shooting, and similar exercises, indicates the growth of the finer motor areas between the years of seven and twelve. The interest of girls during the same years in sewing and playing with dolls, which involve the finer activities, is an indication in a similar direction. The activity of the speech center begins early, but has its greater development within the first three or four years. When special attention is given to specific exercises demanding skill in distal groups of muscles before the more proximal muscles have been trained, we often find neuroses supervening. Dr. Hartwell has made extended studies in regard to stammering and stuttering in this relation. In former days those destined for a musical career were put at their special work—for instance, on the violin—at as early an age as four; but experience has shown that such education ought not to be begun until the child is seven or eight years of age. This experience is in accord with the neurologic fact just mentioned, that the motor centers for the fingers and wrist begin to acquire special activity after the age of eight years. The selection of voluntary exercises for the development of this neuromuscular mechanism ought, then, to be practically completed before the boy or girl reaches the teens, for the apparatus is pretty well developed by that time. Gymnastics, so called, affect chiefly the

larger groups of muscles. The finer groups concerned in independent finger movements, activities of the larynx, facial and tongue movements, are not trained by gymnastics; their exercise must of necessity come in other ways. The playing of games of children . . . involves the discipline of these motor centers. . . ." *

Some general principles of physical exercise.†—1. The *general effect* of muscular exercise, that is the effect on the vital organs, is in proportion to the number of foot pounds of work performed.‡ We must use the largest and strongest muscles and muscle groups, in trunk, shoulders, and thighs, and *make them work*, if we wish to quicken the action of the heart and lungs. We get the best results, so far as health is concerned, not when we merely go through motions, such as finger flexions and gestures of a gentle nature, but when we push, pull, throw, lift something that furnishes a "load." When we move the body or its larger parts, as in rising on our toes, it can be made to furnish its own load. The load we give a muscle should vary according to health and strength, and with the length of time the muscle works. The longer it is active, the smaller should the load be.

A good practical test to use during or after the exercise period, to tell whether there has been overwork, is to "notice the hands when held with fingers extended and free from each other, the arm being held away from the body. If the fingers are trembling, there has probably been too much effort."

2. The position demanded by the muscles and ligaments

* Luther H. Gulick, *Physical Education by Muscular Exercise*, pp. 20, 21. Used by permission of Blakiston and Sons, publishers.

† For a fuller statement of these principles, see pp. 10–17 of Gulick's work, quoted above.

‡ A foot pound of work is the amount of work performed in lifting one pound to the height of one foot.

during exercise is likely to be continued during rest. Moreover, the kind of power or skill demanded by an exercise will of course be developed by that exercise. Our muscular (and to some extent, mental) vocations stamp themselves in our bodies.

3. When working for general effect, that is the effect on the vital organs, care should be taken not to cramp those organs. Effort causes the blood vessels to swell and increases internal pressure. This, if the organs are cramped, leads to labored and irregular heart action, and influences unfavorably, digestion and the peristaltic movement of the intestines. Under proper conditions the agitation of these organs, as by running, is very desirable.

4. Oxygen breathed into the lungs is not necessarily used by the body, any more than is food when swallowed into the stomach. Bodily processes, especially exercise, should create a *demand* for these things. Of course, moving the diaphragm is one form of exercise, and unused air in the lungs is probably harmless. There is, however, no evidence to show that any considerable quantity of oxygen can be stored in the body and held for use as required; it must be breathed in from moment to moment, as it is needed.

5. Consciousness is not necessary in order to secure the general effects of muscular exercise. One could exercise with profit when asleep or hypnotized, so far as the vital processes are concerned. The more our exercise can be made automatic, the less the drain on our nerve energy. Nervous fatigue is closely related to the exhaustion of the higher brain centers; the lower centers do not tire easily. The best exercises for nervous people are those that can be made automatic, rhythmic, playful.

Nervous children should not be given exercises that

demand concentrated attention and quick response to commands. Wherever it is desirable to economize nervous force, there should be few directions, the exercises being taken largely by imitation, memory, or play. This shows how futile it is to expect to secure rest and recreation by turning from mental tasks to exercise that demands close attention and quick response in following commands. Experiment shows that such formal gymnastics are more fatiguing, to most children, than anything else in the curriculum save mathematics.

6. Whenever a high degree of consciousness is for any reason necessary or desirable, it should be as pleasurable as possible. As a college student, Garfield found that working for wages in a carpenter shop would not take the place of the recreative exercises demanded by student life. The great value of games for children is at once apparent. The father is wrong when he argues that his son can take exercise just as profitably by splitting wood as by playing ball or skating.

Individuality in physical education.—Physical culturists often speak of "perfect" development; but there is no one standard of physical perfection for all. We should not take too seriously the tables of averages and statistics of what one "ought" to weigh and measure at a given age or height. That is "perfect" for us which fulfils our purpose. There may be thousands of perfect human forms, all different, each answering its own purpose. Not all men should feel called to be very strong, nor all women to be very weak. Let each be developed, according to his nature, so as to make him most socially useful.

Physical education for children.—The most important fact to build on here is that the child is for the most part

instinctive in his actions. He is largely a bundle of racial habits that will have their way; he is full of stored-up charges of energy ready to go off with a bang, on due stimulation.

Because of this reign of instinct—especially the instincts of play, imitation, and wandering—games, sports, "hikes," and similar exercises must hold first place in the physical education of childhood and youth, especially if we are to secure that indispensable mental accompaniment, interest. Of course these exercises should be supervised, and they should often be gymnastic as well as recreative.

Games need supplementing, however, with more carefully organized work. Many children who play much are still defective in form, shambling in gait, awkward in movement. But the index to the child's physical culture exercises should always be his developing instincts and interests. The order of the development of muscles and muscle groups has already been indicated.

Some day, perhaps, we shall be able to study each child with regard to his physical condition and habits, to see that he has information on topics pertaining to physical welfare, and to develop in him a worthy physical ideal. Work may be prescribed for him individually, work that will enter intimately into his personal life, and include a program of daily health habits, not omitting those practiced at home. Periodical physical examinations will reveal what is accomplished.

The teacher must learn the details of heating, lighting, ventilating, seating, posture, and other matters of school hygiene. She should make clear to the children all this health practice, and why it goes on, by informal talks, and by such permission to help as will make them feel that they

are really participating citizens in a small hygienic commonwealth. By such means, and through parents' meetings, the homes can be invaded with hygienic ideas, and all be made to feel that health is as valuable at home as at school.

Playgrounds.—We have found how much play means to a child, and playgrounds mean no less. It seems unbelievable that adults who were ever children should build schoolhouses tightly wedged in between other structures, like a man cramped in a crowd. We have forgotten that multitudes of children no longer have the play privileges at home that were enjoyed when the great majority lived in the country. Looked at from any angle, moral, social, economic, or pedagogic, the playground pays. Fortunately the movement towards adequate playgrounds is now widespread. We are fast reaching the conclusion that play space for the young—a square rod for each—is, if possible, more important than work space.

FOR FURTHER STUDY

1. Do you follow a personal daily program? If so, what place do you give to physical exercise? Have you planned, or had an expert plan for you, a program of physical culture?

2. Observe and describe the gait and carriage of persons who are devoted to heavy athletics. Do you find the same characteristics in the case of all-round athletes?

3. Was your exercise, when you were a child, properly conducted? If not, how could it have been improved?

4. Which do you think is more favorable to brain development, great strength, or intricate, all-round muscular coördination? Why?

5. Where would you expect to find the finer minds, in a group of football players or a group of tennis players? Why?

6. At one of our large universities a thousand dollars a year is spent on each athlete, while but four dollars a year is spent on the physical education of the average student. What meaning do you draw from this?

7. Have you the kind of body and health you would like your pupils to possess? If not, how can you get them?

8. It has been said that there are four types of student, the athlete, the sport, the scholar, and the idler. Does this agree with your observations?

9. What differences have you noticed between the sports of boys and those of girls? Do you think you could teach boys to play the girls' games and vice versa? Why?

10. How do you feel now with regard to the games you played as a child? Why?

11. Select ten students who take very heavy exercise, ten who exercise daily but moderately, and ten who exercise very little. In which group do you find most muscle? Which group do you find most alert mentally?

12. Note the following points concerning yourself (a) when you have neglected your exercise, and (b) when you have exercised properly: courage, kindly feeling for others, ability to concentrate, memory, thought power.

REFERENCES

Bancroft, Jessie Hubbell, *School Gymnastics.*

Dodworth, Allen, *Dancing and Its relation to Education and Social Life.*

Gulick, Luther Halsey, *Physical Education by Muscular Exercise.*

——, "Interest in Relation to Muscular Exercise"; *American Physical Education Review,* June, 1902.

Hall, G. Stanley, *Youth: Its Education, Regimen and Hygiene.*

Johnson, Geo. Ellsworth, *Education by Plays and Games.*

McCurdy, James Huff, *Bibliography of Physical Training.*

Mero, Everett B., *American Playgrounds.* (Contains bibliography.)

Rapeer, Louis W. (Editor), *Educational Hygiene.*

Rusk, Robert R., *Introduction to Experimental Education*, Ch. III.

Sargent, Dudley A., *Physical Education.*

——, *Health, Strength and Power.*

American Physical Education Review. (Files.)

CHAPTER VI

HOW THE MIND WORKS

"Psychology is a science, and teaching is an art; and sciences never generate arts directly out of themselves. An intermediary inventive mind must make the application, by using its originality."

. . . .

"For the great majority of you a general view is enough, provided it be a true one; and such a general view, one may say, might almost be written on the palm of one's hand." *

EXERCISE.—Think of anything you please,—a castle, a fairy palace, another moon for the earth. Analyze your idea. For example, tell all the sounds, colors (and dimensions), touches, smells, and tastes that can be experienced about your castle. Do you find any that have not, at some time, formed a part of your own experience?

Before the discovery of America, do you think anyone ever dreamed of being attacked by Indians just like our American Indians? Why?

Having dealt with the general method of caring for the child's body and making it a fit support for his mental powers, we turn now to a brief and sweeping view of these powers themselves. These powers *are* the child: he is not a body merely, with a mental lodger in the upper story of it; he *is*, ultimately, his thoughts and feelings. To know him, we must understand them, and that means that we must study psychology, the science of human nature. That we

* William James, *Talks to Teachers*. Used by permission of Henry Holt and Company, publishers.

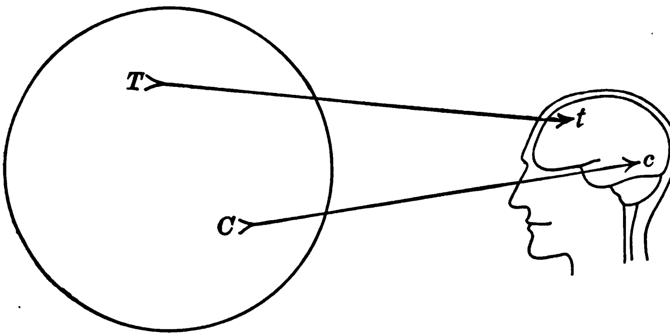
shall do in the present chapter in an introductory way, preparing for the treatment later of various phases of mind and the method of dealing with them.

The mental and the environmental.—All through our early education our attention is likely to be fixed on things outside our minds, on plants, animals, minerals, land, water, on everything that enters into our environment. But when we try to educate others, we have on our hands a new problem; we must know how their minds work. Even when the pupil is so confused over a lesson that he cannot tell where his trouble lies, the teacher must be quick to detect it and skillful to guide him through it. The best way to find help on this problem is to learn first how our own minds work. We must turn our attention from the environmental to the mental.

We have all observed our own minds in a cursory kind of way, just as we all saw flowers before we studied botany. Even a small boy can tell whether he is hungry, or has a toothache; and hunger and pain are mental. Your friend's "How are you?" and the physician's "How do you feel to-day?" are really requests for you to *introspect*, literally *look within*, examine your own mind, and tell what you find there. But just as in botany we learn to look at the flowers more carefully and to give each plant its place in a plan that includes them all, so we must observe the mind minutely and find how all its machinery fits together.

One of the largest and most important facts, and one of the easiest to observe, is that your mind is a kind of moving-picture machine. It is full of "pictures" of things found in the world around you, the mental pictures of the environmental. In the figure, let the circle represent the environment, and let the brain facing it be yours. Then this brain

contains your mind also, for mind dwells in the brain. *T* is any object in the outside world; *t* is the mental picture



THE WORLD BRAIN: THE HOME OF MIND

of this object. *C* is a color as it flashes before the eye; *c* is its mental duplicate. The object may last long after our mental photograph of it has faded; or we may preserve a clear mental picture of something long since destroyed, say the doll or the ball of childhood days. So we learn to separate sharply between *objects* and our *experience* of objects.

Objective and subjective.—These two words have a large use in the teacher's vocabulary. *Objective* refers to the object-world, the environmental; *subjective* to the mental, to the "subject" who has a given experience. Objective means "pertaining to the object experienced"; subjective means "pertaining to the experience itself." My thought of home is subjective; the home itself, objective. One's nose is objective; the smell of a rose, subjective. Subjective also is the pain in one's stomach, while the stomach itself is objective. *

* If there is doubt as to whether anything is subjective or objective, we can always decide by this simple test: Could the thing in question, under any circumstances, be observed by others, as even one's heart, or one's stomach might be? Or is this, like my pain or my thoughts,

The mind is like a factory.—A factory can only do its work by opening its doors to the outside world. Had these doors remained shut the factory would never have run. Its work consists in (1) taking in raw material, lumber, leather, or what not, and (2) working up this material into new products, shoes, furniture, and the like. The factory cannot *create* any material outright; it can only take what comes and organize this into a new form.

So the mind must open its doors of sight, hearing, and other senses to the outside world. Had these doors remained shut, the mind would have remained inactive and speechless,—perhaps we ought to say there would have been no mind. The work of our mental factory consists in (1) taking in raw material, sights, touches, sounds, and the like; and (2) working up this material into new products, poems, essays, conversations, thoughts, and imaginings of all kinds. The mind cannot *create* any such material outright; it can only take what comes and organize this into a new form.

Let us think of anything we please, say a winged horse with eyes of fire. Here is no new mental material, for we have seen horses, eyes, fire, wings. What the mind has contributed is a new arrangement of old bits of experience. Moving-picture films are sometimes cut up and pieced together to make a new picture story. The mind, also, can do this cutting and piecing. Indeed, it can divide so minutely and recombine so deftly as to form a patchwork picture that would quite discourage a photographer. But it can make no thoroughly new film without exposure to the outside world.

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observable by me only? In other words, is it open to inspection by many, or introspection by one only?

Perception and idea.—The taking-in process of our mental factory is called *perception*. The manufactured product always takes the form of *ideas* of some kind.

When Wordsworth "saw a crowd, a host, of golden daffodils," he was making mental pictures rapidly, "ten thousand" at a glance! In psychological language, he was perceiving. But all the senses may be used: one may put hand in pocket and perceive a coin by touch, may perceive the music of "Annie Laurie" by hearing, and so on. A perception is the freshly received experience of something in our presence.

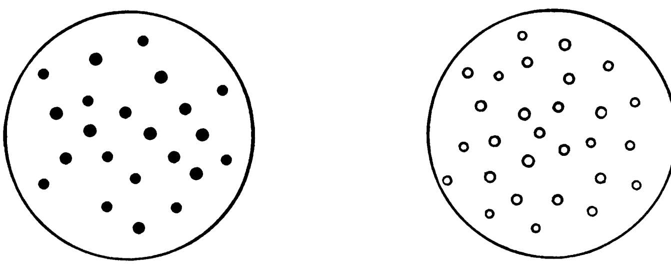
Later, our poet, lying on his couch "in vacant or in pensive mood," finds that the daffodils still "flash upon the inward eye," though the outward eye is closed. He now has *ideas* of the daffodils. An idea is a mental picture of something not present to the senses. But such revived experience need not always be a mere copy of something we have previously perceived; we can form new pictures from our old mental material, as in the case of the winged horse with the fiery eyes. How is this possible?

Sensation.—It becomes possible by separating our mental materials into very simple parts and then recombining these parts, somewhat as a galley of type in a printing office may be broken into "pi" and then set up in new forms. These bits of experience are called sensations. Examples are the color blue, or red, a simple smell, taste, touch, tone. As was said before, these fragments of experience always come to us in the first place, through some "door" of our mental factory, that is, through some bodily organ. A sensation is a simple bit of experience which we refer to some particular bodily organ.

There is a striking difference, however, between a sensa-

tion as we receive it fresh through the sense organ, and the same sensation revived later without using the sense organ. The first, the fresh sensation, is called an *impression;* the revived impression is an *image.* By day, you get an impression of the blue of the sky, clear, strong, persistent. At night, perhaps, with eyes closed, you call back the image of the blue, but find it hazy, faded, and flickering, as compared with its original. An image, then, is a resurrected impression, a kind of ghost of an impression. *

Composition of perceptions and ideas.—In the figure, let each small circle stand for a sensation. The solid black circles represent impressions; the open ones represent the weaker, revived impressions, that is, images.



PERCEPTION IDEA

From what has been said it is evident that a perception is composed of impressions. You perceive an apple. In the perception one of the black dots represents the taste

* We must take care not to be misled by some of the common uses of these words. A sensation is not a wave of excitement that rolls through a whole community, as when some startling news "creates a sensation." An impression is not a lump judgment, such as we have when we speak of our "general impression" of a person or place. An image is not a complex picture; we do not image a whole automobile, but only its color, or the sound of its horn. Our idea of the automobile is composed of many images. As a sensation is perfectly simple, so is an impression, which is a freshly received sensation, and an image, an old sensation.

of the apple, others its color, touch, smell, size, etc. A perception is a group of impressions.*

Similarly, an idea is composed of images. You have an idea of a golden apple. Here the images are those of golden color, hardness, and so on. An idea is a group of images.

An outline of the making of ideas.—It may help us to form a clearer view of the processes involved in our mental manufacturing, if we arrange them in tabular form.

1. Collecting material: *Perception*	Seeing Hearing Etc.
2. Combining material: *Association*	Remembering Imagining Thinking

It is evident, from the second part of this table, that when we associate our ideas (more accurately, our *sensations*), they unite to form memories, imaginings, thoughts. Association and its three forms will be studied in the chapters that follow.

What of "the feelings"?—In the outline above there is no mention of anything like joy, sorrow, love, or hate, commonly spoken of as "the feelings." And these are very important. But we shall find that for the most part the child's "feelings" follow the course of his sensations, perceptions, and ideas. For example, show him a flag and you arouse his patriotism. Because of this, in educating children we are more directly and immediately concerned with

* There are cases in which a single impression, such as the smell of an apple in the dark, arouses many images, and seems, with these images, to form a perception. But a "pure perception," as it is sometimes called, is composed of impressions only.

perceptions and ideas than with the "feelings." Accordingly we shall leave their study until later.

FOR FURTHER STUDY

1. Does a story such as *Alice's Adventures in Wonderland* take you into a world that is entirely new? Prove your answer.

2. What is the difference between mind and brain? Why are not minds preserved in museums, as bodies are? Cannot a library or a collection of phonograph records be thought of as a museum of minds?

3. Is there sound at Niagara Falls when no one is there to hear it? (A hint: Objective, or physical sound consists of vibrations in the air; subjective, psychological sound consists of sensations.)

4. Analyze some of your common perceptions into their constituent impressions.

5. Do you receive any impressions that the lower animals cannot have? Wherein lies the great difference between your mental factory and theirs?

6. Make a list of toys for young children, designed to give them all the different impressions possible through every sense organ.

7. Make up two lists, one appropriately headed *Objective*, the other *Subjective*.

8. Mention games which seem to you valuable for the cultivation of impression, perception, or imagery.

9. When one sees a new or curious object, why does he usually wish to handle it? Answer in terms of impressions.

10. Why does modern teaching make so much use of pictures, models, and handwork?

11. In a southern climate, where snow never falls, how would you teach the subject of snow?

12. A philanthropic gentleman wishes to employ you to

teach color to children who have been blind from birth. Will you accept the position?

13. In your study of literature, note how much depends on keenness of impression and vividness of imagery.

Consider the following:

"When Napoleon saw Moscow burn, it could not have been more brilliant than when I saw the fourteen hundred turrets aflame with the sunset; and there were roofs of gold . . . and architecture of all colors mingling the brown of autumnal forests and the blue of summer heavens, and the conflagration of morning skies, and the emerald of rich grass, and the foam of tossing seas."

T. De Witt Talmage, *The Bells of Moscow.*

REFERENCES

Angell, James Roland, *Chapters from Modern Psychology.*

Betts, George Herbert, *The Mind and Its Education*, Ch. I.

Galton, Francis, *Inquiries into Human Faculty and Its Development.*

James, William, *Talks to Teachers*, Chs. I–V.

Titchener, Edward Bradford, *Primer of Psychology*, Chs. I, III, IV.

Yerkes, Robert M., *Introduction to Psychology*, Chs. VI, XVII; also pp. 396–401.

CHAPTER VII

COLLECTING MENTAL MATERIAL: PERCEPTION

"The training of the senses is a necessary preliminary to the training of the higher powers of mind. Comenius said: 'There is nothing in the mind that is not first in the senses.' Accurate sense perceptions are the best and indeed the only preliminaries to accurate reasoning. The mind can erect a substantial intellectual edifice upon a small basis of sensation, but there must be some sensory basis. The teacher who tries to train the powers of judgment and reasoning upon incomplete and inaccurate sense perceptions is like the man who built his house upon the sand. The wise teacher endeavors to build up the intellectual edifice upon the *rock* of well-ordered and carefully trained sense percepts." *

EXERCISES.—Have you ever known of a painter who was blind from birth, or a musician who was congenitally deaf? Do you think such talent would be possible? Are mutes usually incapable of speech, or more like those people who cannot use tools because they have not learned how? Try to explain such facts as you find.

Draw (or describe) from memory some object with which you are familiar, giving many details. Compare your production with the original. Explain your success or failure.

Poverty of the pupil's mind.—Frequently we fail in teaching because our pupils have in their minds no material from which to manufacture the ideas we are trying to teach

* Dexter and Garlick, *Psychology in the Schoolroom*. Used by permission of Longmans, Green and Company, publishers.

them. One investigation * showed that about half the children did not know a sheep, or a river, or the origin of butter; more than one third did not know what clouds were, and nearly two thirds did not recognize a spade. Some stated that butterflies make butter, or that it comes from buttercups, and that kittens grow on pussy willows.

From such studies, G. Stanley Hall concludes it is unsafe for a teacher to assume that children, when they enter school, know much of anything that will help them in their school tasks. He thinks the wisest thing a parent can do before sending a child to school is to get him acquainted with natural objects, especially those found in the country. He even goes so far as to say that a child at the age of five or six may get more education from a few days spent in the country, than from a term or two of school without such contact with the country.

Clearly, the child's perceptive powers are in danger of being too little exercised.

Objects before words.—If we view education superficially we may be tempted to think that, like Hamlet's reading, it is just a matter of "words, words, words." But words give us only secondhand information; the words of another can have no meaning for us except in terms of our own direct experience. Even pictures are misunderstood. Children who have never seen a cow sometimes think, from looking at a picture in a primer, that a cow is about as large as a mouse. Objects before words, in education; we must practice perception first.

It is amusing to hold up two fingers before a class of students and ask them to interpret the sign. Hardly a girl knows the meaning, while among the boys a grin goes

* G. Stanley Hall, *Aspects of Child Life and Education*, Ch. I.

round. It is evident at once that the grinners have passed through some experience which the non-grinners have not enjoyed, and that the two fingers are a sign of that experience. The girls do not understand because they have never had the experience, have never used this sign as a cryptic invitation to "go swimming!" A sign, without the experience for which it stands, is meaningless.

Now all words are signs, and like the swimming signal are meaningless, unless one has had the experience they are designed to call up. It is easier to carry words around with us than to carry the objects for which they stand, just as it is easier to carry money, the symbol of value, than to load ourselves down with the valuables themselves. For this reason we learn, in time, to use words as substitutes for things.

To illustrate: A child of a year or so frequently plays with a ball and at the same time hears the word "ball" used repeatedly. The impressions (redness, roundness, etc.) received from the ball come to be associated with the word, so that either calls up the other. On hearing the word "ball" when the object is not in his presence, the perception is revived in the form of an idea. The word is a sign which brings back the old experience; and if pronounced to others who have had similar experience, it is to them a sign of what the speaker has in his mind.

But if the original impressions have never been received, it is as impossible for a word to call up an image, as it is for a photographer to find a picture on the sensitive plate which has never been exposed. *Impression must precede image.* This is one of the first truths in teaching. Of course some objects we have never seen are sufficiently like those we have seen to enable us to imagine the unseen with some

success. But the man blind from birth cannot be taught color, nor can the congenitally deaf appreciate tone, as we who hear, know it. Whatever the range and vividness of our imagination, it can never supply the lack of a large amount of first-hand experience.

"*Feed* the growing human being," says James, "feed him with the sort of experience for which from year to year he shows a natural craving, and he will develop in adult life a sounder sort of mental tissue, even though he may seem to be 'wasting' a great deal of his growing time, in the eyes of those for whom the only channels of learning are books and verbally communicated information." *

Keep the sense organs in order.—If the child is to obtain news of the external world he must have efficient organs through which to acquire it. Children who have defective eyes or ears are not likely to suspect that they cannot see or hear so well as others, and pathetic cases are all too frequent, of young sufferers who have gone on for years vainly struggling to hold their place in competition with normal children.

It often requires a special test to reveal, even to the practiced teacher, the fact that some of her pupils cannot see the blackboard plainly or hear an ordinary voice distinctly. Simple tests for eye and ear are easily given, and should be applied by the teacher even if not required in her school system.†

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* William James, *Talks to Teachers*, p. 148. Used by permission of Henry Holt and Company, publishers.

† For a discussion of these and related matters, from the practical standpoint of the teacher, see *Everyday Pedagogy*, by Lillian I. Lincoln. For a complete list of educational tests, discussed from the standpoint of the technical scientist, see Guy Montrose Whipple's *Manual of Mental and Physical Tests*.

Test cards for the eye, with directions for using them, can be secured from your local or state superintendent, or from any optician. Ears can be tested sufficiently for schoolroom purposes by placing the pupil at a distance of twenty feet, with his back toward you (to prevent lip reading), and asking him to repeat what you say. Use a low tone or a loud whisper. Test each ear separately by having him hold his hand closely over the unused ear.

Cases of serious defect, or of apparent disease, should be tactfully reported to parents.

Sense training.—Sense training, that is, the general exercise of the senses for no particular purpose except to wake up the senses, is valuable for infants. It is to be hoped that the time will come when all mothers will start their children's education with such happy exercises long before school age. The eyes of the one- or two-year-old should be presented with all the colors and with pleasing combinations of color; his ears with all the tones of the scale, melodies, and harmonies; his skin and muscles with objects that give him great variety of touch and movement. Even smell and taste should not be neglected. If such sense training is not provided at home, we must furnish it at school. For the child, this is a warm and lively world of things that bounce, slide, roll, run, squawk, boom, clatter, sing, flash, flutter, shimmer, and thrill,—in other words, a world of perceptions.

But sense training of this general kind should never be given a prominent place in school exercises for normal children. It is too much like musical training which teaches us to play no instrument in particular, but bids us bang and thrum and blow a few notes on each, to wake up the musical faculty in general.

Perception with a purpose.—We have learned that the scientist, before he sets to work to collect material, usually knows what he is to collect it *for*. A problem is to be solved, a project worked out; he is like the builder who has a gap in his wall and is searching for a stone of correct shape to fill it.

It is just as useless for a child as it is for an adult, to attempt to perceive minutely everything in the environment. The child, like the scientist, should observe with some question in mind. And this problem should be the *pupil's* problem, not merely a task imposed upon him by the teacher. Observations made just because we are directed to make them are not likely to electrify us very much: they must connect in some vital way with what we as individuals actually want to do.

"What decides the choice in observation is not what strikes the senses, not the intensity or liveliness of external stimuli, but the circle of interest of the child." . . . "Anything which has no interest for the child may be seen a hundred or a thousand times without becoming a mental possession." * A boy is likely to observe the ice on the skating pond much more appreciatively than he does the moral mottoes on the schoolhouse walls.

Further, by watching carefully what kinds of objects a child seeks and observes with most persistence and pleasure, we can obtain a good index to his personality. Nature has made every child a little specialist in his desires. It is true that he is usually so overpowered by the influence of his elders (on whom he must depend for his every gratifi-

* Robert R. Rusk, *Introduction to Experimental Education*, pp. 73, 76. Used by permission of Longmans, Green and Company, publishers.

cation, and even his life), that they can work up in him an interest in almost anything. But leave him to himself and he elects his own course.*

Education proceeds most rapidly when the teacher pays the greatest possible heed to such natural selection; and the sum total of choices and their outcome gives us deep insight into the real nature of the little subject and his future possibilities.

Perception lessons.—From what has preceded, we can draw the following practical directions:

1. Make clear in your own mind and in the mind of the pupil, the purpose of the endeavor, what to look for. Stick to this purpose unless you find something of great and unusual importance that cannot wait for later attention. If a class is going on an excursion, a description, drawing, or sample of what is to be looked for will aid materially. A specific question or set of questions to be answered by observation is likely to increase interest in the undertaking.

2. Get at the real object whenever possible. Why stop with sand models and pictures of mountains if we can climb the eternal hills themselves? This means, of course, that we must make many excursions. The public must learn that pupils are not necessarily wasting their time when seen out of doors during school hours. The teacher must learn to conduct these excursions so as to waste no time.

3. Use as many senses as can reasonably be called into play, but especially "the muscular sense," touch, sight, and

* It is interesting to note the selection of activities of a four-year-old of my acquaintance, who has so far resisted all efforts to interest him in music and musical instruments, and makes no real attempt to sing, but will stand for twenty minutes at a stretch observing one of his butterflies, and will weep at its death. At the same time he likes stories of Indian boys better than those of pickaninnies, because the Indians are "fierce!"

hearing. Nor should the pupil wait for the teacher to point out all items of interest. Each should make a personal attack on the matter in his own way.

4. Let the children *do* something about the situation, climb the hill, taste the apple, bounce the ball. Each may do something different, so long as there is order and harmony and seriousness in it all; one may use his camera, another his sketchbook, another collect notes for a description, another gather specimens.

5. Let vocabulary grow with experience: use the new name while exploring the new objects. Then these new words will enter readily into the child's vocabulary, and uttered later, will raise ideas of the objects.

6. Much can be done in the way of training children to take in a large portion of the environment instantaneously, by requiring a report after permitting a glance at a number of objects in the hand or on a table, which are then covered again. Pictures may be used in the same way. Houdin's method with his son is of this nature.*

Other mental processes may be aroused at pleasure during a perception lesson. We may revive ideas of other objects and experiences, and make comparisons. Feelings appropriate to the occasion may be excited. For example, observation of the rabbit may lead to consideration of its treatment as a pet. Later the objects observed may be made

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* "My son and I passed rapidly before a toy shop, or any other displaying a variety of wares, and cast an attentive glance upon it. A few steps farther on we drew paper and pencil from our pockets, and tried which could describe the greater number of objects seen in passing. I must own that my son reached a perfection far greater than mine, for he could often write down forty objects seen in passing, while I could scarce reach thirty. Often feeling vexed at this defeat, I would return to the shop and verify his statement, but he rarely made a mistake." Robert Houdin, *Second Sight.*

the subject of conversation, writing, drawing, modeling, constructing. And finally the resulting experience may be used as material for thought. Laboratory work is really a use of the perceptive, or "objective" method, but largely as a stimulus for thinking.

FOR FURTHER STUDY

1. Suggest suitable object lessons for (a) mathematics, (b) science, (c) history, (d) language, (e) art.

2. How can a country child best be taught concerning city life, and vice versa?

3. What part should questioning play in the objective method?

4. Write out a list of exercises for mothers to give their children of pre-school age, in order to develop all the senses.

5. A child is left in your charge to be educated. How would you choose objects for his study?

6. Tell some child you will buy him any object he selects in a ten-cent store. Does the result give you any insight into his nature? Would it if you could repeat the experiment many times?

7. What do you think are the danger points of school excursions for purposes of observation?

8. Is any special course in "sense training" or "object lessons" necessary? Or can all this be incorporated with the instruction in the usual branches?

9. A child, being told to draw an object, returns next day with a photograph of it, taken by himself. Should this substitute be accepted? Give reasons.

10. How do you feel when an entirely strange word is used in your presence, the word *comestibles* for example? Can you explain this feeling?

11. Do you know of any people who have gathered much

information, but who seem to be unable to use it to advantage? What may be the trouble in such cases?

12. Which is likely to prove better in clearing up an obscure point for a class, the teacher's verbal explanation, or a concrete illustration with objects? Why?

13. The King of Siam could not believe that water would become so hard as to hold up his elephants. Why was this?

REFERENCES

Bolton, Frederick Elmer, *Principles of Education*, Ch. XVII.

Dexter and Garlick, *Psychology in the Schoolroom*, Chs. VI, VII.

James, William, *Talks to Teachers*, Ch. XIII.

Rusk, Robert R., *Introduction to Experimental Education*, Chs. V, VI.

Schaeffer, Nathan C., *Thinking and Learning to Think*, Ch. III.

Strayer, George Drayton, *Brief Course in the Teaching Process*, Ch. V.

Thorndike, Edward L., *Education*, § 38.

CHAPTER VIII

COMBINING MENTAL MATERIAL: ASSOCIATION

"Thus, for instance, after looking at my clock just now (1879), I found myself thinking of a recent resolution in the Senate about our legal-tender notes. The clock called up the image of the man who had repaired its gong. He suggested the jeweller's shop where I had last seen him; that shop, some shirt studs which I had bought there; they, the value of gold and its recent decline; the latter, the equal value of greenbacks, and this, naturally, the question of how long they were to last, and of the Bayard proposition. Each of these images offered various points of interest. Those which formed the turning points of my thought are easily assigned. The gong was momentarily the most interesting part of the clock, because, having begun with a beautiful tone, it had become discordant and aroused disappointment. But for this, the clock might have suggested the friend who gave it to me, or any one of a thousand circumstances connected with clocks. The jeweller's shop suggested the studs, because they alone of all its contents were tinged with the egoistic interest of possession. This interest in the studs, their value, made me single out the material as its chief source, etc., to the end. Every reader who will arrest himself at any moment and say, 'How came I to be thinking of just this,' will be sure to trace a train of representations linked together by lines of contiguity and points of interest inextricably combined. This is the ordinary process of the association of ideas as it spontaneously goes on in average minds." *

EXERCISE.—Pronounce, or have a friend pronounce for you, any common word, and observe carefully what it makes you "think of." Try to explain why the resulting images

* William James, *Principles of Psychology*. Used by permission of Henry Holt and Company, publishers.

are called up, why these instead of others. Try this with the word "fire."

We have likened the mind to a factory which receives material through the doorways of the senses and then works it up into various products. We have studied perception, the method of gathering this material, and shall now take up association, the combining or manufacturing process.

It will be recalled (see page 63) that we separate our mental pictures into bits of experience called sensations, colors, tones, tastes, and the like. These unit bits of experience are then re-combined, associated, to form new pictures. * How is this brought about?

The machinery of association.—When we look at a road map of any much-traveled country, we find its highways intersecting and crisscrossing in all sorts of intricate ways. If we could have our brains charted, we should doubtless see a much more mazy labyrinth than any road map ever showed. No one knows that there is such a thing as a brain "path"—it would probably be nearer the truth to speak of brain *wires;* but the idea called up by paths and the way in which paths are worn makes it easy for us to picture

* Bill Nye furnishes an illustration of this in his humorous theory as to how the portrait of any man whatever seems to be made up on demand in the printing office. There are supposed to be interchangeable parts, consisting of "one pair eyes (with glasses), one pair eyes (plain), one Roman nose, one Grecian nose, one turn-up nose, one set whiskers (full), one moustache, one pair side-whiskers, one chin, one set large ears, one set medium ears, one set small ears," etc., from all which can be made up the faces of "clergymen, murderers, senators, embezzlers, artists, dynamiters," etc. (*Bill Nye's Red Book.* Used by permission of Charles C. Thompson Company, publishers.) Whatever is done in newspaper offices, our minds have just such sets of images, and we make up our mental pictures on this very plan, albeit not quite so mechanically.

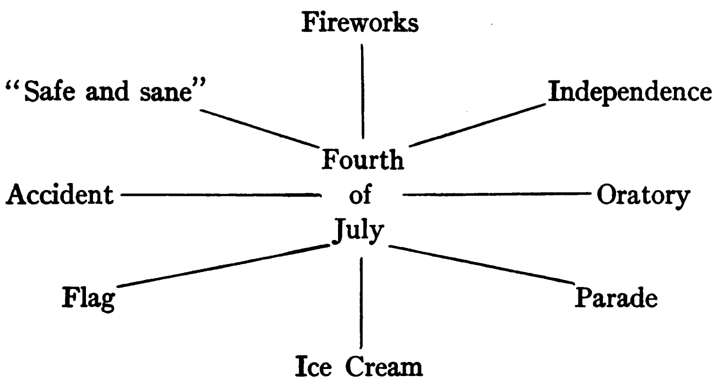
to ourselves the part which the brain plays in the association process.

When water flows with moderate force for a long time, or with great momentum for a short time, through some channel capable of erosion, there is cut out a passage which is likely to be followed by all succeeding streams. Similarly when a paper has been well creased by folding, it will thereafter double most easily along the old lines.

The brain forms habits, ways of acting, paths,—call them what we will. It does most easily what it has done before. To take a classic illustration: suppose the baby sees a candle, which excites brain cell *C*, and thereupon receives a burn from it, which excites brain cell *B;* the next time he sees the candle a nervous current will sweep along the association fiber *C–B*, and baby will think at once of his former burn and be wiser than he was before. There is much truth, then, in the humorous remark that a man who is bitten twice by the same dog probably is not good for much else. If his brain is of such poor quality that an experience like *that* will not set up a lasting brain path, then nothing will ever stick; he is uneducable. The reason why experience is often the best teacher is because it is more certain to plow out such useful brain paths. We may recall here, too, that *character* first meant a stamp, scratch, or something of similar kind. One's character, as represented in his brain, is the sum total of the scratches, the brain paths found there.

The laws of association.—The most general law of association is that whenever two experiences have been in the mind together, each of them, on returning, tends to bring back the other. "Winter" calls up "snow"; "Christmas" brings to mind a picture of Santa Claus.

But any idea, such as "Fourth of July," may have been experienced along with a host of others, as suggested by the diagram. Now, while all of these, according to our law, *tend* to come back to mind when the Fourth is mentioned, it would overtax our mental capacity to entertain them all at once. Only the strongest can survive in the struggle.



But what makes an idea strong? As teachers we want to know how to get "seven times eight" strongly associated with "fifty-six," "Captain John Smith" with "Virginia," "obedience" with "parents and teachers."

Four further laws of association have been found, which explain why certain ideas crowd out their associates. These may be named the laws of:

1. Frequency
2. Recency
3. Intensity
4. Brain-set

1. Let me put before you the word "bread" and you need not tell me what it calls to mind. Bread and butter have been so frequently in mind together, both as objects and as

words, that most of us cannot escape the association. A path is worn and kept open by frequent travel, a sluice by frequent coursing of the water, a brain path by the frequent coursing of an idea. *Repetitio mater studiorum*, "Repetition is the mother of learning," was the motto of the old school.

2. Sluices and paths, including brain paths, tend to close with time. If a path has been opened or re-opened recently, the ideas that travel it have the advantage of a free highway. We are all a little like putty, holding the imprint of what touched us last. The final speaker in the debate, all else being equal, has the best chance to win the judges. Your pupils will contrive to get a glimpse of the lesson at the last possible moment before reciting, especially if they have not taken advantage of the law of frequency of repetition.

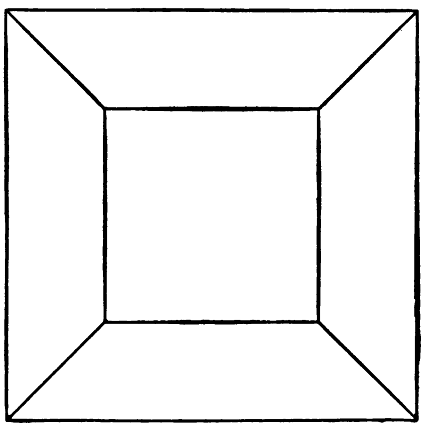
3. The path that has been fairly plowed out by intense scraping, or the waterway worn by even the single passage of a torrent resulting from cloud-burst, may be deepest and most lasting. "I'll make you remember this,"—so we threaten the infliction of something intense. When the word "fire" is presented, a few persons are always found who think first of some dangerous experience with fire which occurred, it may be, years ago.

This law cannot be used constantly in teaching, but only in driving home rare and important truths. He who shouts all the while has no way left of emphasizing anything.

4. Why are water channels so winding? And why do our associations take such curious twists? Much depends on the "lay of the land." Streams of water and streams of association follow the easiest way. Speak the word "note" in a company, and the business man thinks of legal paper,

the lover of a *billet-doux*, the musician of his scores. Each thus reveals the set of his brain, his dominant interest, his habitual center of attention.

Brain-set may be for the moment only. If I have been reading of ghosts, every white streak, rustle, or hoot gives me a thrill. Or such a set may be of longer lasting. It is the banker's occupation, year in, year out, that makes him associate everything with money. One's whole nature may be set by heredity, and for life, as in the case of the "natural-born" artist, musician, or what not. The boy, Benjamin West, shears the cat's tail to make a paint-



brush. Another person cannot tell the colors apart, but lives and thrives on mathematics.*

Apperception.—Apperception is personal view, due to brain-set. For example, look at the figure above and tell

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* Considered in this large sense, our fourth sub-law of association no longer stands on the same level with the others; it underlies them. For what has the young man, a born follower of some vocation such

what you think it represents. After you have decided, read the footnote.*

Apperception is "taking in" anything, as a perception or an idea. But what happens when anything is taken in by the mind? The newcomer is not left standing alone and neglected. Old images hasten to welcome it, join hands with it, make it feel at home if possible.† So when you began the study of algebra, you probably apperceived it as a kind of arithmetic with letters for figures. Another subject, perhaps the beginning of Latin or geometry, may have seemed so entirely new and strange that you could not make it mean much of anything for a time.

Suppose a child is set in our midst: what is he for each of us? To the teacher he is a learner, some one to be developed into manhood; to the manufacturer he may be a cheap spindle tender; to the physician he is a possible patient whose health must be guarded; to his older sister he is perhaps a blundering nuisance who does not understand her love affairs; to one boy he is a chum; to another, an enemy to be feared; to his mother, joy unspeakable. So the child

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as electrical engineering, thought of most frequently, recently, intensely? His darling subject, in terms of which he interprets everything else. Our very thoughts are determined long before we think them.

* By previous suggestion to the observer, this figure can be made to "look like" a picture frame, a lamp shade, a beveled mirror, a pyramid with the top cut off, a tunnel, or any one of a hundred other things.

† In my classroom is a dummy book, bound as books usually are, and stamped on the back "Beauty Secrets." It is interesting, after a class has perceived a few real books, to watch the faces when this dummy is opened, revealing nothing but a mirror and a comic inscription. Why the surprise? Because, as usual, they had images of the inside of the "book," just as we habitually image the legs of a table when we can actually see its top only. They apperceived the dummy as a book, but found they must apperceive it as a box.

is apperceived, interpreted, given a meaning, according to our personal brain-set.*

Apperception in teaching.—If anything on entering the mind stirs up no images, it has no meaning. Having a *meaning* signifies just that,—arousing associations. What does "picnic" or "birthday" mean to you? Just what you associate with it. If our teaching is to mean anything to the children, it must arouse many images in their minds. But what if perception has never brought into their mental factories the necessary kind of material?

1. First of all then the pupil must have an "apperceptive basis," as it is called, for what he is to learn, something to hitch the new knowledge fast to. We always interpret the present in terms of our past experience,—what else is there to interpret it by? It is hard to make children in a flat country appreciate mountains, or those in a tropical climate appreciate snow, or to make city children appreciate country life. The child who has not worked with objects in arithmetic can put no meaning into the figures the teacher makes on the blackboard. Our first question should always be, "Have my pupils had practical experience enough to enable them to get the meaning of this lesson?" If they have not, we must give them the experience before we give the lesson. This is one of the values of excursions, dramatization, laboratory work, experiments, practical perceptive experience of all kinds.

2. We must get down to the level of the child's associa-

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* A poetic example of apperception is found in *Jest 'fore Christmas*, by Eugene Field:

> "Father calls me William, sister calls me Will,
> Mother calls me Willie, but the fellers call me Bill!"

Each name suggests the mental set of the one who uses it.

tions, to whatever apperceptive basis he has.* It is useless to waste time telling how poorly our pupils have been taught. We should find out how much (or little) they know, and begin where their knowledge leaves off. One who was sent to teach a semicivilized people the use of the steam engine, found that all attempts to teach them the science of the engine, the expansive power of steam, and the like, were lost on them. He at length succeeded by telling them that there is a giant in the engine who gets mad if you heat him, and who will blow everybody up if he is not given all he wants to drink; that he sticks out his arm (the piston rod) and works hard for you if you treat him well.

Granted that a lesson contains anything really new, it is practically impossible for the teacher to make it too simple. The danger is usually all the other way. Good teachers are good explainers (though good explainers are not always good teachers); and explaining a thing is just putting it in such terms that your listener can apperceive it easily. Use images of seed and soil when you explain to the farmer; pictures from the shop for the mechanic; from familiar affairs of child life for the children.†

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* Try this on your apperception: "Now it is certain that the fundamental category must include all entities and all processes whatsoever; its name must have a universal denotation. But that which denotes everything cannot especially denote anything, that is, can connote nothing. That which all things are is not a feature or property by which some things are distinguished from any others. And furthermore, the universal predicate cannot be complex, for then it would have parts which would be entities and of which the universal predicate could not be predicated."

All this is simple enough, when you are prepared for it. But if you find it obscure, you know just how your pupils will feel if you fail to reach down to their apperceptive level.

† I once asked a class of about one hundred twenty-five Normal School students how many believed they had been appreciably influenced by the morning exercises of their elementary-school days.

3. Since one's brain-set, his fundamental purpose, is a matter of inheritance, we should not seek to fashion it at will. We inherit our memory, thought power, imagination, emotion, as we do our height, strength, and health powers. Conscientious teachers often feel guilty when they have exhausted their art and failed to arouse interest in all pupils for all subjects. It would in many cases, if not all, be a great misfortune if the well-meaning teacher succeeded in her effort to wrest the associative processes of these budding geniuses from the paths they love. We cannot tell ourselves too often that each child has his own sacred nature and way of developing.

Sensation types.*—Suppose we all tell of a journey, or of a walk through the woods, or describe what we should regard as an ideal day of living. One would talk much of things *seen;* he is of the eye or visual type, "eye-minded" as we say. Another would speak mainly of things heard; he is of the ear or auditory type, "ear-minded." A third would describe in terms of touches and movements; he is of the tactual or tactual-motor type. A fourth may use all these kinds of material, as gathered by eye, ear, and touch (including movement); he is of the mixed type. Smell and taste do not figure prominently enough to give names to types. We can see at once that the whole matter rests on the sense organ we rely on most, and the resulting predominance of a certain kind of mental material. Most of

Only four raised their hands. I am inclined to think that our morning exercises often consist of such formal and mature readings, songs, and hymns, that they do not "strike home" with the children, that is are not effectively apperceived.

* Various other terms are used in place of this, such as "memory types," "types of mental imagery," and the like. But "sensation type" seems to be the simplest and most appropriate term for all the facts.

our pupils are of the visual type. We should teach them through their eyes chiefly, but of course not wholly.

It is of high importance that we find out the sensation types of those pupils who learn with difficulty. The pupil of auditory type, who tries to spell our English words by sound, will have a hard time of it. He will succeed better if he can call up images of the way they look, or of the "feel" of the movements of tongue, lips, etc., necessary in naming their letters, or of the movements of the muscles in writing them. We can find out our pupils' sensation types, at least in a rough way, by observing their language, oral and written, and summing up the various kinds of image used. A special exercise might be devised for this purpose.

The best minds, I believe, readily take in and associate all kinds of sensations; they are of the "mixed" type. Very likely we should so shape our exercises as to encourage our pupils to do the same, but we should leave them, at length, to succeed by their own method.

FOR FURTHER STUDY

1. Why is it hard to "teach an old dog new tricks"? Can an old man easily learn new truths?

2. When a wee girl who had no shovel at home went calling, she spoke of the neighbor's fire shovel as a "big black spoon." Explain.

3. Apperception has been called "the interpretation of the new in terms of the old." Show that this is true, and give an original illustration.

4. Which sense organ do you rely on most in perceiving? Which kind of image do you employ chiefly in remembering?

5. Why do the paradigms of Latin require so many more repetitions than the theorems of geometry? What apperceptive basis does the student usually have for each?

6. Recall a few events which you feel you can "never forget". What has given them such a strong associative setting?

7. In England, boys were at one period taken to important boundary marks and there thoroughly whipped, that they might thereafter bear witness as to the landmark. Was this good psychological practice? Why?

8. Why do we find in our language such expressions as "bread and butter," "thunder and lightning," "peaches and cream?" Explain, from the standpoint of association.

9. "More than two thirds of all objects drawn by young children are decidedly in action," reports G. Stanley Hall. What does the brain-set or dominant interest of the children have to do with this?

10. Explain why scenes on the stage seem so real to us. Do we "see" any more than is actually there?

11. Explain in terms of apperception, why the definition of a subject such as arithmetic should come at the end of the textbook, rather than at the beginning.

12. Why is a man willing to be called a "lucky dog" when he is unwilling to be called a "cur?" What do we commonly associate with each?

13. What is the difficulty, from the standpoint of association, when we say that something (such as a strange word) has no meaning for us? What does it mean to have a meaning?

14. There are said to be images or ideas which appear in consciousness, not because of their association with anything else, but mysteriously and independently. Does your experience lead you to accept the statement? If so, can you suggest an explanation in terms of brain activity?

REFERENCES

Betts, George Herbert, *The Mind and Its Education*, Ch. VII.

Galton, Francis, *Inquiries into Human Faculty;* articles on

"Mental Imagery," "Number Forms," "Associations," "Antechamber of Consciousness."

James, William, *Talks to Teachers*, Ch. IV.

Read, Melbourne Stuart, *An Introductory Psychology*, Ch. IX.

Rooper, T. G., *A Pot of Green Feathers*.

Schaeffer, Nathan C., *Thinking and Learning to Think*, Ch. XII.

CHAPTER IX

REMEMBERING AND IMAGINING

"Every young man who thinks he must indulge in a little sowing of wild oats before he settles down to a correct life, and so deals in unworthy thoughts and deeds, is putting a mortgage on his future; for he will find the inexorable machinery of his nervous system grinding the hated images of such things back into his mind, as surely as the mill returns to the sack of the miller what he feeds into the hopper. He may refuse to harbor these thoughts, but he can no more hinder their seeking admission to his mind than he can prevent the tramp from knocking at his door. He may drive such images from his mind the moment they are discovered, and indeed is guilty if he does not; but not taking offense at this rebuff, the unwelcome thought again seeks admission." *

EXERCISES.—What did you do last Saturday? Write a brief description of the process by which you recall the day's doings. Aside from any evidence that may exist in the external world, such as the letters you wrote last Saturday, etc., how do you know that you remember the day truthfully?

Describe an ideal holiday. How does this process differ from remembering?

At this point, it will help us to look again at our "outline of the making of ideas."

1. Collecting material: *Perception* { Seeing / Hearing / Etc.

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* George Herbert Betts, *The Mind and Its Education*. Used by permission of D. Appleton and Company, publishers.

2. Combining material: *Association* { Remembering, Imagining, Thinking }

Having gathered our mental materials as perceptions, we work them up, associate them, into ideas. There are three forms of association: memory, imagination, and thought. In this chapter we shall study the first two.

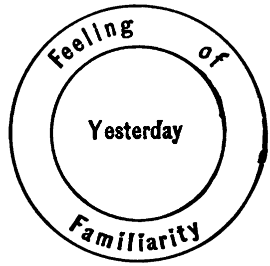
The study of these forms of association is an important one, for the great difference between the wise and the otherwise, or even between man and lower animals, lies not in the senses, not in the ability to take in mental material, but in the power to *use* it, to make something in our mental factory turn out such valuable and artistic products as true thoughts, useful inventions, pleasing poems.

What is memory?—If we attempt to draw some object of familiar experience, we shall find it is not the lack of manual skill alone that prevents us from filling in all the details. Many of them have vanished from mind. Also, we are likely to include much that is not really "there." Mark Twain humorously said that when he was young he could remember anything, whether it ever happened or not; but as he was getting old, he should soon remember that only which never happened. No doubt we have all victimized ourselves and fallen into mild or deep disgrace by "remembering" what never happened, as well as by failing to include in our mental sketchbook some very important items.

Memory, then, does not photograph the past; it is not a duplicate, letter-press copy. The past as such is "lost and gone." Memory is a *reconstruction* of the past, plus a recognition of the past *as* past. The essential feature of such recognition is the feeling of familiarity. In the figure,

let Y be some experience of yesterday. Y' is our memory of that experience, less vivid, but with a halo of familiarity.

Y



Y′

I have, let us say, a life-size portrait of every member of my class. When the class has been graduated, it represents the lost and gone; it will never again assemble as before. I place each student's likeness—each standing for a mental image—in the seat he once occupied, and the whole feels familiar. This typifies my memory of the class. Let me now change the order, standing some of the portraits on their heads in corners and suspending others from the ceiling, and the whole feels strange,—I never saw my students in such positions. This typifies an act of imagination. It is only by the accompanying feeling that we can tell whether we are remembering or imagining. Memory is that form of association which is accompanied by a feeling of familiarity.

Not memory, but memories.—To say that one has a good memory does not mean much unless we tell what it is good *for*. As no man can do all things well, so no memory can retain all things well. Most of us can remember easily along the lines of our greatest interests, but in other directions with difficulty, or not at all. The pupil who holds readily every new tune he hears, may find that his arithmetic or history evaporates out of his mind during a night.

If we are sensible, we shall not abuse nature for giving us poor memories because we cannot remember everything, but push forward fastest where our memories work best. As Betts says, "*The best memory is the one which best serves its possessor.*"

This fact of special memories for special branches comes out in experiments on memory and attempts to train the memory. Committing poetry will help us little, if at all, in remembering the facts of history or mathematics. We improve our memories along the direct line of our practice, but little along side lines. In the light of this, we can see the doubtful value of any general scheme of "memory training," or of studies whose chief virtue is "to improve the memory," as compared with a pursuit designed to improve *a* memory, and that memory the one the individual wants to use in his vocation. The hoarding of memory gems may easily be overdone; sometimes a child does not want to be such a mental jeweler—or miser. Sympathize with him and spare him.

Frequency, recency, intensity, brain-set.—These general laws of association hold true of memory, since memory is one kind of association. But as we have dealt with them elsewhere (Chapter VIII), we shall here only briefly indicate their application.

The law of frequency demands much repetitive drill. The stair of learning has many monotonous steps, and there is no elevator. One who seeks the highest success in any line of endeavor should spend the odd moments reviving old items of knowledge and forming associations, fixing in mind prices, dates, faces, election returns, laws, formulas for action, whatever his vocation requires him to master.

The law of recency may easily be abused. The public

speaker soon learns better than to keep up a mental rehearsal of his speech to the moment of delivery; and the best pupil is one who can dispense with the last peep before the recitation begins. It is well to possess such a snapshot, emergency memory, but it is also wise not to use it except in emergencies.

Intensity demands concentration, the strict focusing of the mind on the matter in hand. Attention has wisely been called the "mother of memory." Concentration is the student's master art. But one cannot concentrate on every sort of matter indifferently. In the long run we can center our energies on that only which appeals to our native, inherited powers.

The most favorable mental set involves a lively interest in the work, and the maintenance of a mood of calm confidence. Faith in one's ability and high resolve on mastery often mean the whole difference between success and failure. What is in line with one's largest natural interest is most easily mastered, since it most readily commands entire attention and forms many strong associations.

The art of remembering.—The following precepts are fundamental.

1. See that the physical conditions are as favorable as possible. It is commonly supposed, since James made the assertion, that one's brute force of memory, his native brain plasticity and power of retentiveness cannot be increased. Certainly, however, it can be diminished. Excesses, or bad habits of eating, sleeping, breathing, or exercising may ruin the best memory. The student who sits up all night to cram before examination is likely to find, at the critical moment, that the wires are down, so that he cannot even call up the knowledge he has. The only reason why some

children appear weak-minded is because they are working with fatigued or impoverished brains. Here again the student must see that real wisdom means the care of body first. One should be fresh, not only when trying to remember, but when committing to memory.

2. Commit to the understanding before committing to memory. We are not practicing mental economy, not saving time but losing it, when we dash nervously ahead in the hope of mastering by one quick effort of memory, what we are not willing to take the time to understand. Experiment shows that this precept, "Understand a thing before you memorize it," is the right rule for children also. They are often abused by the neglect of it.*

Too often, in giving out poem work or some similar task, we merely throw it at our pupils, so to speak, with the direction to "learn it." Study of the selection, if it comes at all, comes afterward. This is the most slipshod, easy way for the teacher, and the hardest for the pupils. We may fall into this practice because of our own ignorance of the work, or because we over-estimate the attainments of our pupils. We must charge our minds with facts until we can make every word of the selection alive with associations. It should be well read, perhaps several times, by the teacher for her pupils. When the pupils themselves have read and

* "Much the greater part of the work of memorizing . . . is effected by explaining carefully to the pupils the matter to be learned and by cultivating habits of intelligent analysis and synthesis. Efficiency in memory work depends mostly upon the systematic apprehension and the rational comprehension of the significance of the matter. It is this aspect of memory which is capable of most development, and the teacher's efforts in this direction are bound to produce beneficial results. More time should be spent, especially in the lower classes, in the presentation of the matter, and less in mechanical repetition." Robert R. Rusk, *Introduction to Experimental Education*, p. 87. Used by permission of Longmans, Green and Company, publishers.

re-read it, it will almost have committed itself to memory.*

Of course a child may practice an art successfully without knowing the science, may reduce to habit what he cannot fully explain, as the average child does and should do when he first works with our decimal system of numbers. But speaking generally, if a child is unable to understand a given selection, then the time has not come for him to memorize it.

3. Since memory is based on habit, put the mind through the same kind of process in learning that it is supposed to follow in reproducing. We all know the alphabet, but none of us can say it backwards rapidly, unless he has learned it that way. The forgetful husband, before he leaves home, should vividly picture himself in the neighborhood of the shop where he is to buy his wife's goods; then, when he approaches the spot, the sight of the surroundings will suggest the purchase. This process, strengthened by repetition, will prove almost infallible. The good elocutionist goes laughing and crying through all the acts of her selection while committing it,—that *is* committing it. If the children followed a similar process at the knee of mother or teacher, we should hear fewer singsong recitations in public places. "The child knows better, for I have told him better," is the excuse of many a teacher or parent who thus discloses his ignorance of psychological practice. The only acceptable plea is, "The child knows better, for in addition to good

* There is an old story of a little girl who wrote from memory:

"My country tisuf thee,
Sweet land of libeat tea," etc.

She explained that "tisuf" was just put in to fill out the line, and that "libeat" was a brand of tea!

A certain boy apperceived "earthquake" as "earth cake," a "great big cake of a very nice kind."

precepts I put him through the correct form many times, before he was allowed to come in contact with the incorrect form at all."

4. Keep a mental filing system. As fast as experience comes, select what seems important and associate it to your chief purpose according to the demands of future use. The teacher with a lesson to prepare, the pupil with a composition to write should seize upon the material found in conversation or novel or newspaper, imagine himself using it at the proper moment, and associate it with other related matters in his mind.*

If we fail to cultivate this selective sort of memory, "logical memory" as it is often called, our minds become like the contents of the school boy's pocket, a tangle which makes it necessary to pull out everything in order to get the one thing desired. This is the very trouble with those fussy people who weary us with multitudinous particulars: they fail to come to the point because there is no point—for them. We can help our pupils in overcoming this trouble by the way we question them.

Minor memory rules.—1. Commit by complete repetitions. Experiment shows this to be faster than committing by stanzas or paragraphs or sentences. The method of complete repetitions may not be the best way to attack an

* For instance, just now my own thoughts run this way: "Read this morning a statement by a blind man who says the blind cannot sense colors through finger tips. My students in psychology sometimes assert the contrary. Next time this point comes up I shall remember this additional evidence for my side." So I put this note in my mental filing system, but forget a hundred other facts read during the same hour. I may put it in a paper filing system, too; for the filing cabinet of the office is only so much brain extension. The only reason why we have filing systems other than our brains is because our brains cannot stand the strain of our voluminous business.

extremely long selection, but it is best for passages of ordinary length.

While learning, recall as much as possible without reference to the book. When the selection is fairly well learned, you will find certain difficult points where you stick. Stop the complete repetitions and *practice on these sticking points until they are mastered*. Then resume complete repetitions.

2. Divide your time wisely. Choose frequent, short study periods, rather than infrequent, prolonged concentration. Four forty-five minute periods a week are better than two ninety-minute periods. Granted one hour a day to spend on a subject, we should divide it into two thirty-minute periods, or even three twenty-minute periods. How far this division of time can be carried profitably has not been discovered.

3. Prolong drill beyond the point of first mastery. To cease effort as soon as a selection can be said over, is to fail to recall it under critical circumstances. Memory fades rapidly for a brief period closely following the learning process, after that much more slowly.

4. Watch yourself as you work, and devise your own personal tricks of memorizing and recalling. Some people can remember best by using one sense only while memorizing, as the eye; others prefer to read aloud, so as to use both eye and ear, etc. Again, probably each has his own best rate of committing to memory. Evening study for some students seems to be preferable to morning work. Rhythm, where it can be introduced, aids in recalling.

The memory of the child.—It is commonly supposed that in childhood the power to memorize is better than at any time thereafter, and that therefore the child may rightly be required to lumber up his mind with vast bulks of mate-

rial to be used in later years. The supposition is false and the resulting pedagogy vicious. Experiment shows not only that the power to memorize improves from childhood well into adult life, but also that whatever has no meaning for an individual is learned at an extravagant cost of time and nerve energy. Some people insist on the necessity of drilling in formulas such as are used throughout life; but if such formulas really have any lifelong necessity about them, they are likely to drill themselves in. Personally, I would not have a child learn anything, unless he could see for himself that it meant something and was good for something.*

Learning.—Memory is closely involved with habit and with acts of skill. Consequently further discussion of memory will be found in the chapter on "The Learning Process."

The nature of imagination.—Imagination is just another kind of association. As memory is that form of association which is accompanied by the feeling of *familiarity*, so imagination is that form of association which is marked by the feeling of *strangeness*, or unfamiliarity. I can imagine

* In addition to what has been stated, the following important facts concerning the memory of the child have been fairly well established: that there are many special memories which develop at various rates, such as memories for objects, sounds, words, abstract ideas, etc.; that these special memories are likely to be highly efficient at age 10–12, less so at age 14–15; that boys can deal with abstract ideas more successfully than girls; that the memory of girls is superior to that of boys at age 11–14, but that the boy thereafter catches up in his development; that the memory for numbers and that for abstract ideas develop together, and both rather late; that lung capacity and muscular power are correlated with good memory; that the ability to memorize increases up to age 22–25, at least; that the most rapid learners show the highest degree of retentiveness; that the power to memorize can be improved by practice; that school training does not affect the power of memory to any considerable extent; that there is some connection between memory and general intelligence.

Of course, these results are not applicable to any single individual, but are suggestive with regard to general practice.

myself President of the United States, but such a situation seems strange. I cannot conjure up the feeling of familiarity that would assure me I had ever held the office.

Laws and limitations of imagination.—Once more, the laws of combination are the same, frequency, recency, intensity, and brain-set. What distinguishes imagination from memory is the kind of feeling that goes with each. If this feeling vanishes, we cannot tell whether our mental concoction is "really so," or whether we dreamed it. Children are often confused in this way and so utter "lies" without limit. When adults indulge in this sort of "lying," become adept at it, we call them poets, novelists, dramatists.

It is often asked whether we can imagine anything new. This is an ambiguous question: (1) Can we create *new images* at will? No; we can exaggerate or dwarf or intensify or tone down the old ones, but the only way to get new images is through the use of the sense organs, by getting new impressions. Let one imagine what he will, a castle, a fairy, heaven; he will find his picture composed of the same old images, for we have but one stock of them, saved from the experiences of our past. (2) Can we combine these old images into new forms? Yes; and here we enjoy the dignity of something like creative power, for we can originate patterns, combinations of images which probably never have existed before since time began.

The imagination, then, can create no new material, nor has it any new laws for combining old material. Its whole business is the *recombination of old images into new patterns.*

Culture of the imagination.—As we have memories rather than a memory, so we have imaginations rather than an imagination. My imagination for history may be poor

indeed, while my imagination for scientific matters may be more active, or my poetic imagination may blossom like the rose. The chief use to which anyone can put his imagination is a *vocational* use. It should aid him chiefly in the accomplishment of his life purpose, mathematical, scientific, literary, or what not.

Here, as in the case of memory, the best physical condition is essential. The following rules may also be safely recommended: (1) Determine for what purpose the imagination is to be used. (2) Collect an abundance of material of the kind most needed. If one wishes to write poetry, he should read a great deal of the kind of poetry he expects to produce. The inventor may well study the patent office reports. (3) Practice first by following the efforts of others, then independently. Imitative exercises will open the way for originality and beget creative activity.

The imagination of the child.—We have already spoken of children's lies. These form one example of the luxurious exuberance of youthful imagination. Here is the great loosening up process of the child's mind. He knocks apart the old prosaic blocks of everyday experience, and sets up new and marvelous combinations with delightful recklessness. He is using the very same power that enables the scientist to make his most startling hypotheses. It is largely this that creates in the child his boundless appetite for stories, and sets the youth ransacking the library for fiction; but merely to follow others forever in their psychic rambles is to be a mental slave.

Experiment indicates that the following statements probably hold true of the child's imagination: that the younger children have the more vivid, concrete images, chiefly individual, and mostly visual; that each has his own

rate of association, which indicates nothing as to his intelligence; that it is unwise, generally, to urge children to "be quick," when they have a problem to imagine out; that most of the child's imagery results from experiences *out of school;* that his imagination tends to be vagrant and imitative, rather than systematic and creative.

FOR FURTHER STUDY

1. Do you think that those who have the keenest senses are likely to be the best associators? Why?

2. Find individuals who have an unusual memory in some direction, and question them as to their methods. In how many such instances do you find reliance on any special "memory system"?

3. Along what line is your memory best? Does this line harmonize with your chief interests?

4. Note in yourself the effect of the following on memory: digestion (and indigestion), exercise (or lack of it), wakefulness, impure air, excitement.

5. If you could choose never to forget anything, would you do so? Why?

6. Which kind of image (visual, auditory, etc.) do you use most in remembering? What does this mean?

7. Have some one pronounce for you the following syllables at the rate of about one per second: dap, vac, jaf, lar, bex, bup, hif, lis, mor, zuc, puj, dac. Write down as many as you can from memory. Do the same with twelve unrelated, one-syllable words, and also with twelve one-syllable words that make a sentence. Compare the results. What do they mean?

8. Write your name and address backward, letter by letter. Why is the process so slow, although you remember the matter so well?

9. Next time you read an exceptionally funny joke,

imagine yourself telling it to some one else. Does it reappear in consciousness later, at the right time?

10. State your experience with cramming (for examinations, etc.).

11. If a child found difficulty in learning his history lesson, how could you help him by means of your knowledge of memory and imagination?

12. Read part of a story, then stop reading and finish it in your own way. How does your result compare with the author's?

13. Imagine and describe a world in which the laws and processes we are familiar with are reversed.

14. Try to invent some article mentioned in a patent office report, such as a combined knife and fork for a one-armed man; then turn to the report and see how your idea compares with the inventor's.

REFERENCES

Betts, George Herbert, *The Mind and Its Education*, Chs. VIII, IX.

Rusk, Robert R., *Introduction to Experimental Education*, Chs. VII, VIII.

Schaeffer, Nathan C., *Thinking and Learning to Think*, Ch. XI.

Tracy and Stimpfl, *Psychology of Childhood*, Ch. II, Sections II, III, IV.

CHAPTER X

THINKING

"The world within should be made to correspond with the world outside of us." *

EXERCISES.—Try to foretell, not merely guess, the character of some event of to-morrow, say the weather. Write an account of the process by which you reached your conclusion. When the event occurs report whether you were correct, and why.

Review Chapter I.

What is thinking?—We have seen that mental materials can be put together, built up, associated into various forms —memory, imagination, thought. As memory is the form of association that is accompanied by the feeling of *familiarity*, and imagination is the form of association that is marked by the feeling of *strangeness*, newness, novelty, so thinking is the form of association that is characterized by the feeling of *reliability*.

When I summon images of myself as a college student, the feeling of familiarity results; I am remembering. If the images are those of myself studying in Paris, the coldness of unfamiliarity sweeps in—this never happened; I am imagining. But let me count the cost of studying in Paris, compare it with my income, take stock of all I know or can find out concerning the proposed course, and there comes out the conclusion, "I can, or cannot, be a student in

* Nathan C. Schaeffer, *Thinking and Learning to Think.*

Paris." Whether the judgment is positive or negative, it arouses the feeling of reliability; it shapes my course, I am ready to act on it, to go or to stay. Even if I am swamped in the process, or have not sufficient facts on which to base a conclusion, there is still a feeling of reliability. I am sure that I do not wish to act without a further clearing up of the matter. *

What is the thinker trying to do?—When the Harvard-Yale football game is played on the Yale grounds at New Haven, a miniature reproduction of the game is flashed on a screen before an audience in a great hall in Boston. The individual players are not seen, but the path of the ball can be followed in its course up and down the field, and the scores are counted.

The actual field at Yale is the world we live in; the picture field in Boston is our thought world with its images. In so far as we succeed in arranging our images to correspond with the arrangement of things and events in the outside world, we think truthfully; if we are "mixed up" and disorderly in the arrangement of our images, if they do not represent the external order, we are thinking erroneously.

The thinker, then, is trying to make mental pictures that

* We can readily see how closely memory, imagination, and thought are interwoven. While we treat them separately for the sake of clearness, yet all memory, if put to the test, involves thinking; and thought is sometimes defined as a kind of imagination. If our memory is questioned, we at once proceed to think out the case; we resort to tests which are regarded as reliable, to prove it. My mother's letter reminds me that I should have written to her last week—or did I? The feeling of familiarity does not quite come. But I must have done so, for here she mentions what I wrote of my recent illness; this is reliable. Then I recall familiarly my words and the circumstances of the writing.

represent truly something in the outside world. His effort is to make the "world within" "correspond with the world outside of us." *

An example of ordinary thinking.—I learn that "shooting stars," if dug up soon after they have fallen to earth, are sometimes found frozen fast in the ground. Why is this? Perhaps the ground was frozen where they fell? But no; this happens in the summer. Could the shock of striking cause cold in any way? Absurd; such collisions always cause heat. Perhaps the meteor is made of ice? But how can this be, when they are seen to be sizzling hot as they fall? I have heard of freezing by means of chemicals!—that's it. The "star" must carry a chemical that causes it to freeze fast.

What are the steps here? (1) A problem challenged me. (2) This problem started a chain of associations such as my limited stock of knowledge could furnish. (3) Some of these ideas were opposed by others, "knocked out," as it were, and given up as valueless. (4) One suggestion remains unopposed, since it agrees with all I know about the matter. This idea is accepted as true.

Here we have pictured the usual course of our loose, everyday thinking—what we may almost call thoughtless thinking.

Thorough Thinking.—To get a good sample of thorough thinking, let us review the steps in scientific method (see page 17). The steps in this method include:

1. Getting a definite question to answer.

2. Collecting instances, observing facts that seem likely to have something to do with the answer.

* It is true, of course, that the mind can think about itself as well as about the external world, but the principle remains the same.

3. Putting these facts into a class or classes, and finding what can be said of them, that is, generalizing.

4. Making guesses, hypotheses, based on the facts, suggesting possible explanations.

5. Testing to see which hypothesis, if any, is the correct one.

6. Using the new truth as a basis for further reasoning.

Science is said to be systematized common sense. Evidently, I need to be more systematic in my quick, common-sense solution of the mystery of the "shooting star." In the first place, the star is not really a star at all. Besides failing to get a definite question to answer, I have failed in the other steps; failed, finally, to test my accepted conclusion. I should either have examined a meteor to see if it bears a chemical that could cause freezing, or I should have held my judgment in suspense. But suspense is just what most of us cannot bear.

The astronomer, picking his way carefully through many facts, finds that such meteors come from a region of almost unthinkable cold; that even when heated on the outside by passing so rapidly through the air they are still frigid within; that it is this inner cold which freezes some of the larger ones to the ground when they strike.

Such an experience should be enough to convince me that it is rather rash to try to think along other lines than my own. My conclusions in astronomy are worth little. My mind is too hazy on such matters.

From hazy to definite.—If the teacher's mind is hazy, what can we expect from the pupil! Every child begins with foggy ideas of big, vague bulks of things, seen dimly through the mist. The general process of the clearing up of his mind may be illustrated by the procedure of an artist

in charcoal for whom I once sat. She began by darkening the whole picture surface; then, with deft strokes of her eraser and the artful touch of cunning fingers, she caused one mass after another to stand out from the original chaos and take shape, until finally there we all were, trees, clumps of bushes, the old roadway, the rock, my book, and myself. It is from such a dark and formless mass that the child, with much strenuous blundering and re-formation, gradually works out clear and meaningful mental pictures.

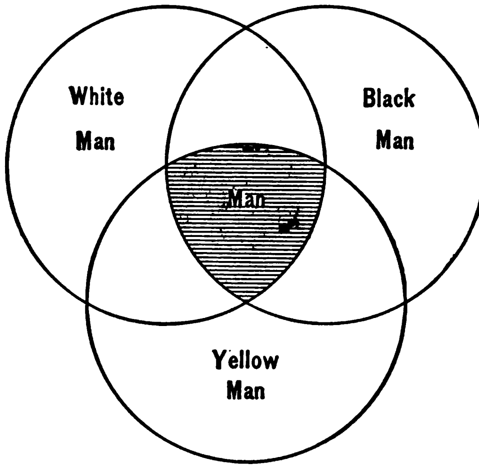
So, when he attempts to form his idea of "man," it comes about that long before he tries to define just what the word shall mean for him, his consciousness is printed with all sizes and shapes and colors and conditions of men, like a blackboard which, carelessly erased from time to time, is written over again and again, the most frequently traced characters standing out most plainly.

The forming of clear ideas.—If we would make our pupils clear thinkers we must develop in their minds clear ideas, especially ideas that take in whole groups or classes of things, such as *noun*, *continent*, *star*, *animal*, *man*. These class ideas are called concepts.

Most of the concepts used by the average man are indefinite. They grow in their own natural and half lawless way, and are not clearly outlined, but consist, one might say, of ragged-edged splotches of meaning. Anyone who will try to tell, without referring to the dictionary, exactly what he means by *tree*, *man*, *burglary*, *truth*, or any one of thousands of other words he is recklessly using from day to day, will know just what is meant.

How does a child get his general idea or concept of *man?* At an early age he hears the word "man" used frequently in the presence of one of these higher animals, and if his

experience is very limited he may regard "man" as the individual name of this one person. If so, *man* may include as a part of its necessary meaning, whiteness and whiskers. But later the term is heard applied to a black man without whiskers, etc. The situation may be suggested by a figure.



At length, that which is common to all these men stamps itself on his mind more thoroughly than the accidents of color and whiskers; there is a central core, a common nucleus of meaning which "man" always suggests.

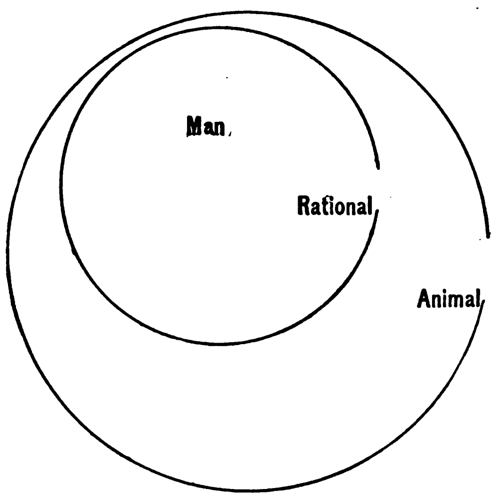
The more of these overlapping circles there are, that is the more individuals the child perceives, the more thoroughgoing will his concept be. When he is building up the concept *fruit*, for example, he should have direct experience with many kinds of fruit, compare them at length, and try to tell what is common to them all. Fruit is the part of a plant that contains the seed. We should then test the idea by applying it: Are potatoes fruit?

The steps in the very important process of forming a con-

cept are: (1) perceiving a number of samples, * the more the better; (2) comparing these samples; (3) generalizing, finding what is common to all the individual samples perceived; (4) testing and applying the idea, practicing with it, so to speak, in order to get used to it and to be able to use it.

Definitions.—Definitions play an important part in teaching. What is a definition? The word (from *de* and *finis*) means a boundary limit, a fence, as it were, which keeps in all objects of the sort defined, but keeps out all others. At the gate to this enclosure certain tests are applied to determine who or what may enter, as a ticket is required at the door of the theater. These tests are found in the definition itself.

We can illustrate this by means of a figure. Man is com-



monly defined as a *rational animal*. Now many creatures

* This process is sometimes called *presentation*, since the objects are "presented" to the senses.

can pass the *animal* test and so find their way into the outer circle; but human beings only can pass the test of *rationality* and be admitted to the inner circle among men.*

Making finished definitions is the work of a mature thinker, and should not be expected of children. But it is good for them to attempt such crude definitions as their tongues can turn off. It is easy to understand, now, why the definition should usually come at the end of the study of a topic, rather than at the beginning. It is the solid matter thrown down by a great deal of boiling.

Children's thinking.—Experiment has contributed little, so far, to our knowledge of children's thinking. This field still lacks explorers.

But since thinking is a form of association, we know at once that our old laws of frequency, recency, intensity, and brain-set must come into play. Thought is sometimes defined as the application of old experience to new problems. But what old experience is likely to be on hand to meet these fresh emergencies? Evidently that which, as related to the present problem, has been most frequently repeated, most recently lived, which was most intense, and which fitted in best with the dominant brain-set. By keeping these simple laws in mind, we can explain many of the child's thoughts which would otherwise appear vagrant and random; † and

* The definition shows what is essential to each individual who is permitted to "pass." As there is often a difference of opinion as to what is essential, different definitions of the same term often appear. Man may be defined as a featherless biped (the definition offered by a Greek philosopher), or the animal with a chin, or the self-conscious animal.

† Una Mary, having been told that her soul was the part of her that "could not be seen," later visited a museum, observed a skeleton and concluded that her skeleton must be her soul. (See References at end of chapter.)

we can keep alive in his mind the facts he will need most in solving his problems.*

As no one has a general power of memory that enables him to remember all things equally well, so no pupil can be expected to think along all lines. We are fortunate if we find even one-talent thinkers. And each pupil, so far as possible, should be given, or permitted, thought problems that appeal to him personally, that lie in the direction of what seems likely to be his specialty.

Training to think.—1. Let the child confront a problem that is real *for him*, not only as to kind but as to difficulty. How long do we adults ponder problems that are thrust upon us by our friends, and in which we take no vital interest? They check, rather than stimulate, our associations. Children are similar. There is not likely to be real thinking except in the presence of a real wonder-situation. Making a violin from a cigar box may rouse more thinking than does the computing of cube root.

2. See that the thinker has an abundance of material of the kind the solution requires. Giving him mere words and symbols is not ordinarily sufficient. There must be plenty of concrete experience to aid in forming ideas and stimulating associations. The composition topic which hangs loose in the child's mind and sends him at once to the encyclopedia is not likely to start much thinking. Many geometry students need to shear off pasteboard angles and saw some wooden circles.

Having gathered this abundance of material, he must form his ideas and concepts as thoroughly and clearly as

* This shows the value of a thorough review as a preliminary to attacking a new topic. See the discussion of "Reviews and Tests," Ch. XV.

possible. As we have seen, this demands the presentation and comparison of many different examples. The child who has seen apples and oranges only does not know *fruit.*

3. Practice the thinking process with the child. By means of questions and examples stimulate and guide him in the solution of problems, until the more usual thought processes are fairly established. We must work *with* our pupils, until they catch our methods and are able to work alone. We must not be afraid of giving too much help in the beginning, if only the pupil's mind keeps pace with our own.

We must teach him the importance of getting all the facts in the case, and that he must "go slow" about forming a conclusion. Teach him that it is better to keep on collecting facts and *let* his mind think, than to *force* it to work on an empty stomach.

4. Frequently have pupils translate thought into action, abstract words and other symbols into concrete reality, verbal descriptions into shop products. We must all test our theories in this practical way. It is dangerous to dream too long without finding out whether we can in some measure make our dreams come true. Any store loafer can furnish a quick solution for the most profound problems. But it does us all good to be forced to show what lies back of our arguments, what right we have to them.

5. Do not try to force your authority or that of a book on your pupils, but cultivate in them a wholesome critical attitude. Keep the pupil asking, concerning statements he is expected to accept: Just what does this mean? Is it true? How do I know?

FOR FURTHER STUDY

1. Study the following and see whether the precepts given under "Training to Think" are here applied:

"For this lesson the teacher had rigged up in the basement a rude windlass with a rope running along the floor. The children were allowed to handle the apparatus, and they easily discovered that the rope could be wound up. At this point the teacher proposed to one boy that he might see if he could wind up the rope with some one holding back on it. He chose a boy of his size, and was surprised to find it was so easy to do. He then tried two, and so on till he came to six. Here he stuck, but he said that if the handle were closer up to the axle he could pull up more, as he could run it round faster. The teacher fortunately recognized this idea as the true budding of scientific method, and instead of ignoring it or deciding upon its merits dogmatically, called the attention of the rest of the class to the statement, without indicating whether she agreed with it or not. In the language of the logician, the boy had stated a working hypothesis. About half the class thought the boy's idea was right. In order to test his hypothesis, the boy proposed to bore a hole halfway up the bar to which the handle was attached, and thus bring it closer to the axle. An auger was obtained and this was done. . . . When the little boy . . . had placed his handle nearer the axle, he soon found that he could pull up fewer boys than before. His hypothesis, useful while it lasted, had been disproved by facts, and he did not need to turn to the teacher and ask whether he had been right or wrong." *

2. What would you do to build up in a child's mind the concept "horse"? "Noun?" "Fruit?" Should the objects presented be very similar? Why?

3. Describe the circumstances under which you have done some of your best thinking. If you had a hard problem to solve would you try to reproduce these conditions?

4. Can you compel your mind to think out a new problem within a set time? Is it right to require much new thought-work in a one- or two-hour examination?

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* Colin A. Scott, *Social Education*, pp. 174–176. Used by permission of Ginn and Company, publishers.

5. Thinking is the application of past experience to present problems. Explain and illustrate.

6. What is the difference between thinking and mere guessing?

7. Why not subject pupils, without question, to the authority of teacher and textbook?

8. Work out a practical example of each of the precepts given under "Training to Think."

REFERENCES

Dewey, John, *How We Think.*

Hunt, Una, *Una Mary: The Inner Life of a Child.*

O'Shea, M. V., *Every-day Problems in Teaching*, Chs. IV, V.

Schaeffer, Nathan C., *Thinking and Learning to Think.*

Scott, Colin A., *Social Education*, Ch. VIII.

Strayer, George Drayton, *Brief Course in the Teaching Process*, Chs. V, VI.

Thorndike, Edward L., *Principles of Teaching*, Ch. X.

Tracy and Stimpfl, *Psychology of Childhood*, Ch. II.

CHAPTER XI

EDUCATING THE FEELINGS

"There is not the slightest doubt that the patient application of the experimental method will presently solve the problems of feeling and attention." *

EXERCISES.—Pronounce the following words and note the feelings they arouse: mother, home, stars and stripes, love. Now try these: yellow, buzz saw, amplitude, pencil. What causes the difference?

Write a detailed description of your like or dislike for some object or person, including if possible an account of the genesis of the feeling.

General nature of feeling.†—The quotation above indicates that our feelings and emotions have much about them that is still mysterious. We do not understand them nearly so well as we do the *knowing* processes, perception, memory, imagination, and thought.

One reason for this is that feeling is so indefinite. The mind may be likened to a body, the skeleton of which is formed by perception, memory, etc., and the fleshy portion by the feelings. The knowing processes, like the bones of the body, are definite, stable, and jointed together to form one unified whole. The feelings are indefinite, unstable,

* Edward Bradford Titchener, *Lectures on the Elementary Psychology of Feeling and Attention.* Used by permission of The Macmillan Company, publishers.

† We must be careful not to confuse feeling with touch or perception; one does not feel with his fingers. The word *feeling* should suggest pleasure, displeasure, joy, sorrow, anger, love, hate, or the like.

contradictory in their quick ebbings and flowings, not fitted together, apparently, so as to show much unity or system.

Another important fact is that feeling does not correspond with the outside world as thought does. Two stand gazing at the sunset. "How sad," feels one, "for but last week my dead love watched the sunset with me." "How joyous," so run the emotions of the other, "for to-morrow is my marriage morn." Now the sunset is there in the physical world as surely as anything can be, and would remain there if both the watchers perished. It sets up a mental reproduction of itself in the minds of both; but their feelings are not a mental reproduction of the sun or the clouds, nor is it the purpose or business of these feelings to represent truthfully, to correspond with, anything at all in sun or clouds. For this reason there is such a thing as true and correct *thinking* about sun and sunsets, but no such thing as true and correct *feeling* about them. It is no doubt correct to think that the sun gives out heat vibrations; but it is neither correct nor incorrect, true nor untrue, to feel happy or unhappy in the presence of the sun. Each furnishes his own feelings, so to speak, while the sunset, as an external object, remains the same for all. Our feelings then are peculiarly our own; they depend largely on the condition of our nervous system.

Why feelings are important in teaching.—Knowing is an instrument, a means to fine living, though a very necessary one, as a skeleton is necessary to prevent one from being a jellyfish. Feeling is not so much an instrument or means to anything else; it is an end in itself, our heart of hearts. It is that which gives value to everything else. We wisely inquire about our friends, not by asking what they know, or how they think, but how they *feel*.

We shall find, too, that many, if not most of our acts, important and unimportant, are decided on the basis of feeling. We take a glass of soda water, marry this or that man or woman, select a blue tie instead of a red one, join one church or another, because we *feel* like it. Children, especially, base their decisions on feeling. Liking or disliking the teacher makes much more difference with them than liking or disliking the President does with us. And their accomplishment in any branch depends upon whether they "just love" it or "just hate" it. Interest, which puts high voltage into a child's brain currents, is chiefly a matter of feeling.

The teacher should cultivate her own feelings also. "Knowledge is power" when you are dealing with *nature;* it makes no difference to your chemical experiment whether you look crossly or pleasantly at the test tube, if you know what is going on in it. But it may make a great difference with your teaching if you look crossly or pleasantly at your pupils. In dealing with *human* nature, *feeling* as well as knowledge is power. The impolite clerk loses the sale. The impolite nation loses power and respect. The austere moralist lacks influence, while the smiling boss catches the ballot. The profound student often lacks the "human nature" necessary to success as a teacher, while the mediocre intellect behind a cheerful, sociable face scores large. We teachers who want to reform the world after an idealistic pattern should let good will flow freely, through hand clasp, and voice, and eye, and smile, and every other channel.

Culture and control of feeling.—First of all, let us observe that our old laws of frequency, recency, intensity, and brain-set hold here also. For these are simply the laws by

which brain paths are formed, the laws by which the living wires of the brain are strung. Given a perception or an idea, and the resulting feeling will be the one most frequently, recently, and intensely associated therewith, and the one which fits in the best with our present set of mind. One need only mention "home," "the holidays," or "graduation," to start characteristic feelings in the hearts of all. But no one has equally strong feelings for everything. As each has special aptitude in some kind of memory and thought, so has he in feeling. No one, probably, appreciates all kinds of music, poetry, and architecture; all love, labor, and devotion,—animal, human, and divine. Here as everywhere the possessor of even a single talent is to be congratulated. We should keep this in mind in dealing with children, and not expect a sympathetic emotional response to every lesson. We *may* score a high success by failing to rouse interest, for in this way we often discover what not to do.

In addition to the above, the following precepts are most valuable.

1. See that physical conditions are favorable. Brain-set depends largely on bodily processes. When the body has plenty of energy to meet all demands made on it, the resulting feeling tone is pleasant; but when the drafts of energy are so great that the body cannot well meet them, cannot pay its bills so to speak, we have a condition conducive to irritability, petulance, peevishness, destructive tempers of all sorts.

Let us have patience with the half-fed, the sleepless, the diseased, the overworked, those who are poor in nerve energy both in school and out, even if they are often irritable and rebellious. Probably there never was a case of chronic

bad temper that did not have a physical basis. Many school children are unruly for this very reason. Perhaps we cannot always remedy the case, but we can keep our own nerves fresh, and ease the situation with patience.

This means that all who would remain cheerful must have a reasonable amount of time for recreation, pure pleasure. It is the teacher's first duty to make her pupils happy in their work. To insure this, she must beware of applying herself so unsparingly as to become chronically solemn.

2. To create a liking for any situation or subject, provide for successful activity in it. Successful activity is accompanied by agreeable feeling, and vice versa. Thus do we entertain our friends, by getting them to do something, and do it with success, even if it is only talking. And so do we like to be entertained.

School is not mere entertainment, but the principle holds true. The pupil must feel that he is succeeding, or he will withdraw from the campaign if he can. Recall the pure joy you felt the first time you actually read off a whole paragraph of some foreign language without referring to the "vocabulary"! It is worth while to go slowly sometimes, to provide easy exercises, and try, by every means that does not sacrifice the general good, to give each pupil a flush of this feeling of success. Similarly superintendents and principals should help timid teachers to feel that they are succeeding.

3. Control feeling, not directly, but indirectly, by controlling the sensations and associations that give rise to it. This rule, wherever it can be carried out, will enable us both to evoke *desirable* feelings and to repress feelings that are *undesirable*.

Thorndike gives three ways by which desirable feelings may be called forth: (a) by ideas connected with the emotion in the past, as when joy follows the announcement of a favorite excursion; (b) by imitation—our emotions follow those of our group or set; and (c) by the bodily response characteristic of the emotion. *Act* kindly or bravely and you *feel* kind or brave. "This last is indeed the surest way to secure the presence of an emotion. In the long run our feelings grow into harmony with our conduct." * Treat the unwelcome caller cordially and he will soon be welcome. Pet the repulsive child in your school and he will cease to be repulsive. Many a brave man has found that courage is largely a matter of habit; if we *act* as if we are not afraid, we shall soon have no fear.

Similarly, undesirable feelings may be dispelled by substituting new sensation processes for old, and so generating a new feeling in place of the old one. Show the baby a new toy and he often forgets to cry for the one he had. So punishment often introduces some quick, sharp sensations, and creates a new center of interest. Set the mind at work on a different subject if you want a different feeling.

4. Quench an emotion in its beginning, or else if possible let it exhaust itself by running its course. Wherever no moral wrong will result, it is always better that an emotion once aroused should "come out" in some form or other. If it cannot be expressed, it should be coolly thought over, introspected, analyzed, dissected, and thrust into outer darkness, never to return. One who cannot by some such process rid himself of hideous thoughts and black emotions is in dire need of a confessor.

The angered child may either (1) be distracted by other

* Edward L. Thorndike, *Principles of Teaching*, pp. 199, 200.

stimuli at the beginning of his passion, or (2) if it has reached a high pitch, he may be disregarded and allowed to wear out his ill feeling by sulking or otherwise, so long as he does no damage. But it is probably unwise to use summary measures when the passion is at its height. Later, when he is in docile and sympathetic mood, encourage him in a kind way to reflect on his ill behavior, and lead him to set his mind firmly to resist future attacks. We older children also may well engage in such reflection during calm moments, and establish a mental set, enforced by a resolution, such as "Keep cool," that will flash into mind at the critical moment and prevent an outbreak. Often our passions get the better of us because we "forget." *

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* Self-consciousness is a form of disagreeable feeling so common as to deserve special treatment. It frequently troubles the teacher, and students often ask for a remedy for it. The following will help to dispel it.

1. Have a regular daily time for reflection: criticize your errors unsparingly, praise your good deeds unstintingly,—it is only when compared with divine perfection that you are a poor worm,—lay your plan for the future; then live, for the rest of the day, with all the abandon of a good actor, and refuse to think of self; you have more important business on hand.

2. Feel kindly toward every one; don't regard your neighbors as critics, but as *friends*. Feel the same toward a class or an audience. If they are friends, you should enjoy having them look at and listen to you. We should all do our best for each other, all struggle upward together.

3. Lose yourself in some large cause, preaching, kindergartening, healing, whatever seems to you to be most worth doing. Compared with the advancement of this great purpose, what may happen to your little self is not worth thinking of.

4. In any embarrassing situation, keep your mind on *results*. Look ahead to what you aim to get done. Never mind the details of method just then, nor what others are saying or thinking—*go on! Get there! Achieve your purpose in spite of all.*

We cannot overcome self-consciousness by a single effort, however. Practice makes perfect here, as elsewhere.

Interest and attention.—Interest and attention are, as Titchener says, two sides of the same state of mind. Interest is the *feeling* side, attention the *knowing* side.

The old opinion concerning the interests of children seemed to be that the curriculum was fixed, and that the children were to be fitted to it. The teacher was expected to "arouse interest" in it in some way, page after page, point after point. The newer teaching is that the child is the standard. The course of study must be fitted to his needs. Interest in anything means that certain brain cells are ripening; and just then is the psychological moment to teach that thing. Theoretically, this new view is no doubt closer to the truth than the old; practically, with a swarm of children to teach and a swarm of subjects to teach them, we do the best we can.

Nature of attention.—Attention is not another mental process in addition to those we have studied; it is simply the *condition* of the mind. We do not have clouds, wind, sunshine, etc., *and* weather. Weather is just the condition, the relation of all these elements. On my desk I do not have books, papers, pencils, *and* disorder. The disorder is merely the way these things *are*. So attention is merely the way the mind is at any moment.

Controlling attention.—There is no magic way of taking captive the mind of anyone we choose and compelling it to attend to what we will. Something can be done, however, to keep the stream of our pupil's consciousness flowing in the desired direction. This something consists in applying the familiar laws of recency, frequency, intensity, and brain-set.

A kindergarten pupil, being shown a large picture, pointed at once to a small and inconspicuous flag on the

top of a great building. He had just been studying flags in school. If you have recently taught fractions, you can attract attention to decimals by presenting them as a new sort of fraction. Just after a fire story has appeared in the papers pupils will attend intently to the fire drill. A pupil in your room is taken ill; teach now the hygiene of the disease.

Frequency, if it is pleasant frequency, is almost invincible. "Safety first," the motto on the blackboard, the memory gem, anything which is,

"Like childhood's simple rimes,
Said o'er a thousand times,"

wins by its very persistence.

The law of intensity shows its power in bright colors, the sharply pronounced name, the keen pleasure of successful activity. It draws attention to the biggest, the oldest, the greatest, the most beautiful—to the superlative degree of all times and places, and to the "only" * of whatever kind.

Brain-set is the most sweeping law. To begin with, every normal person is born curious. Announce a mystery and you have ~~every eye (and some~~ mouths) wide open. Things *novel* in your classroom, a new object or bit of apparatus, or some new procedure, will make everyone take notice.† A reasonable amount of such novelty is easily and constantly supplied by the changing seasons and the natural progress of our course of lessons.

But it is personal mental set that cuts the channel of our

* A friend states that with no special effort, he has remembered for years the fact that the only silent *m* in the English language is in *mnemonic* and related words.

† Some teachers take advantage of this by establishing a "beauty corner," where objects of aesthetic interest are placed from time to time.

attention deepest. Talk money to the miser and he can hardly choose but listen; the hungry man looks in at the butcher's and the grocer's as he passes; the stamp-collecting boy scrutinizes every letter; your little learners are all alert if you propose a game. Most girls attend easily to sewing, most boys to whittling.

Fortunately we are becoming rich enough and wise enough to furnish the materials and let the children work out their natural interests—*grow* into an education. But it is still necessary, many times, to arouse interest in school work, and secure attention to it, by setting the pupil's heart on something that lies beyond,—the pleasure of his parents, his standing in the community, "getting a job," making a living. We should center the feelings of each on the highest object he can appreciate at the time, and then try to see that his ideal grows as he grows.

FOR FURTHER STUDY

1. Make a list of people who are very thoughtful, and one of people who are very emotional. Which seem to succeed better? What does success mean?

2. Criticize the romantic ideal of life, that is, the ideal that makes feeling the guide. Is it characteristic of feeling to plan far ahead?

3. Would it be wise for one to kill off his feelings if he could? If not, what is their true place?

4. Which is better when things go wrong, to become angry or discouraged, or to think?

5. Can you think profoundly and feel deeply at the same time?

6. Are you a thinker or a feeler, for the most part? Do you change as you grow older?

7. A lady who had long taken medicine from a certain

type of spoon, found herself unable to enjoy ice cream from a spoon of similar pattern. Why was this?

8. Give some devices for arousing interest and securing attention. Base them on the laws of attention.

9. What does proper expression in reading have to do with the feelings? How can we secure it?

10. How would you deal with a pupil who refused to obey you, evidently because he was very angry or otherwise excited? Can you think of any situation where it is a teacher's privilege or duty to be angry?

11. Do you believe in forced apologies from your pupils? Why?

12. It is right to assume an excellence which we do not possess, as a means to the attainment of it. Debate this. Remember that, "In the long run, our feelings grow into harmony with our conduct."

13. Have you ever succeeded in a branch of study that was permanently uninteresting?

14. State what you believe to be the relation between one's natural inheritance, and his ability to be interested in (and attend to) various branches of study and lines of endeavor.

15. How do you feel when you have recovered from some passion? Can you make a list of feelings which you think should be killed out of one's personality?

REFERENCES

Horne, Herman Harrell, *Psychological Principles of Education*, Part III.

James, William, *Talks to Teachers*.

Klapper, Paul, *Principles of Educational Practice*, pp. 408–420.

Thorndike, Edward L., *Principles of Teaching*, Ch. XII.

Yerkes, Robert M., *Introduction to Psychology*, Chs. XIII, XV.

CHAPTER XII

LEVELS OF LEARNING

"It is a general principle in psychology that consciousness deserts all processes where it can no longer be of use. The tendency of consciousness to a minimum of complication is in fact a dominating law." *

Exercise.—Make a list of from twenty-five to fifty "Samples of Behavior." Include such machine-like behavior as heartbeat and breathing, habits like brushing your hair and sugaring your oatmeal, and more important acts which have cost you some real thinking. Try to arrange them in classes, according to the amount of consciousness necessary for the performance of each.

The business of using the body.—We have now considered all that is most important in our mental make-up. We have yet to study the influence the mind has on what we do. We may call this the business of using the body.

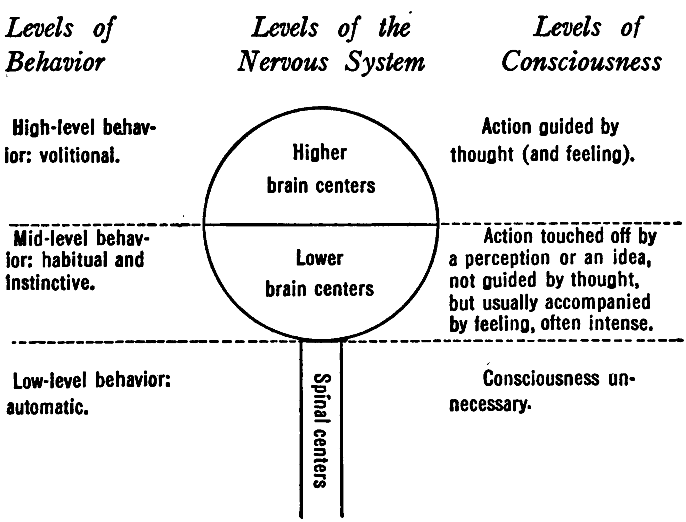
In every well-managed business there are grades of power and service. In the shop, for example, we find (1) the workman at his bench, going through the same process again and again with little variation; (2) the foreman, whose tasks are more various, and who controls many workmen; and (3) the chief of the whole concern.

Consciousness is a good business manager. In the nervous system, we find three levels (see figure, page 129): (1)

* William James, *Principles of Psychology*. Used by permission of Henry Holt and Company, publishers.

the spinal centers, which go through the same process again and again, with little variation; (2) the lower brain centers, whose tasks are more various, each controlling many spinal centers; and (3) the higher centers, where dwells the chief of the whole concern. This chief is yourself.

Levels of behavior, and of consciousness.—In such behavior as ordinary breathing and walking, the body acts much like a machine. Such behavior is called *automatic*. Movements that are automatic are taken care of by the lower workmen, the spinal centers, and require no consciousness to direct them. We shall call this low-level behavior.



Mid-level behavior is a step higher. It is well illustrated by our habits, such as going to classes, eating lunch at noon, going to bed at a certain hour. Here the action is touched off by a perception (such as seeing the clock) or

an idea (as the idea of food). It is not guided by thought; mid-level behavior is usually accompanied by *feeling*, often intense feeling.

High-level behavior consists of those acts which require *thought*, such as choosing which book you will buy, or deciding how you will spend your vacation. Such acts, because they require will, that is, making up one's mind, are often called volitional.*

Low-level behavior.—Some of our automatic, machine-like movements are inherited. Such are the beating of the heart, ordinary breathing and winking, and the change of size of the pupil of the eye under the influence of light.†

As teachers, we are much more concerned with those automatic movements which are not inherited but acquired. Our oldest, simplest, most thoroughly formed habits tend to sink into such a mindless rehearsal of old deeds. Leave your watch at the jeweler's and count how often you pull its ghost from your pocket. Your petty chagrin makes you conscious of the occurrence. Here belong all the perfected performances of muscular skill; the fingers on the keyboard of piano or typewriter become almost as much a part of the mechanism as are the levers and wires within. Our minds laboriously look after the acquisition of all such acts, and then, as James says, "consciousness deserts all processes where it can no longer be of use."

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* The nervous system is not divided into compartments by partitions; and there is no sharp dividing line between these kinds of behavior—they shade into each other. But the division into levels is valuable for practical teaching purposes.

Note that these three levels of behavior require, respectively, ***no*** consciousness, *feeling* consciousness, and ***thought*** consciousness.

† Inherited automatic behavior is called ***reflex***.

Mid-level behavior.—The two forms of mid-level behavior are instinct and habit. Instinct is *inherited* mid-level behavior. An instinct is an old racial trait, born in us because it is absolutely necessary to all creatures whose kind is to continue. For example, those animals, human or lower, that lack the traits which lead to mating and the rearing of young must perish from the earth. They cannot pass on their natures to posterity; there is no posterity for them. Similarly those who have too little self-assertion and energy to win the means of subsistence for themselves and their young are also doomed. Nature offers the prize of life to those only who are willing to strive for it.

This has been true for ages. Evidently those who people the earth to-day must be descended from good fighters and ardent lovers. All others have been persistently compelled to die out. It is no wonder that our race continues to make war, and that love is the greatest theme in literature. These fundamental traits, and others like them, are very old, very strongly "bred in the bone," and are present in some measure in almost everyone.

This means that we are born with certain well-marked brain paths ready formed, or at least born with a strong tendency to form them. Our nervous systems are machines made to perform in a given way. It seems "natural" that the heart should pump blood: it is made to do that. So it is "natural" that the average child should eat, play, imitate, and be self-assertive: his nervous system is made to do that. Because the nerve currents shoot so easily along the ready formed fibers, an old, instinctive act requires little learning; it "does itself," blindly, persistently, but often irresistibly. A bird that has never seen a nest will build one at the right moment. Nor has she any idea how her romance is coming

out.* She builds and bills and coos and sits until—lo! a nest and birdlings.

As teachers, we must learn to use the power of these nervous explosions to drive the car of education. Whenever a child learns a lesson under the stimulus of competition he gets a thrill of the old instinct of self-assertion, rivalry, fighting,—in a modified, modern form.

Habit is the acquired form of mid-level behavior. Habit and instinct are precisely alike, except that instinct is inherited and habit is acquired.† A habit, then, has to be learned; the nerve paths that control it must be formed by individual practice. But once fixed, we do not have to work it. It works us.

Mid-level behavior is blind, unreasoning. On this level we do not *think* how we should act; we *feel* what we desire to do. Yet the great bulk of human behavior is of just this kind. The sitting hen, the playing child, the glutton, the romantic lover,—all have the same reason for doing what they do; they "feel like it." (See Chapter XI, "Educating the Feelings.")

High-level behavior.—High-level or volitional behavior differs from all below it in being thoughtful. Because it is thoughtful it does not, like the lower types of behavior, merely repeat an old performance in an old way, perhaps a foolish way at that. The lower animals, following their instincts, do this year what they did last, and so on to the end of the repeating years. Not so man; the more of a man

* Swallows have been known to migrate and leave their young to starve in the nest. It seems impossible that they can have any clear idea as to what will be the outcome of their behavior.

† Instinct is sometimes spoken of as an "inherited habit." We might also speak of habit as an "acquired instinct." But both of these phrases are of doubtful value.

he is, the more he changes his behavior to suit the circumstances.

Nor is high-level behavior untinged by feeling. The man of thought does not dismiss his feelings as valueless; he tries to make his head and his heart agree.

Levels of learning.—As there are three levels of behavior, so there are three corresponding levels of learning. Our pupils are always using some one of them, and it is often an important question to know which to employ. To teach a child is to make new paths in his nervous system. The question is, by what method shall they be made?

Low-level learning.—Low-level learning is accomplished by repetition as nearly mechanical and mindless as may be. It is illustrated by the boy who runs over and over the words of his spelling lesson, machine fashion, while his mind is chiefly intent on counting the marbles in his pocket. Low-level learning also includes the process of "trial and error," described below.

The illustration shows a form of maze used to test the learning power of animals. The lesson to be learned is the path from the entrance to the food box in the center.

Human beings, when tried in such a maze, "did, on the whole, rather less well than the rats, although some of them,

after their first success, cut down the time for the next success rather more rapidly than the rats. The problem is not one which permits itself to be intellectualized very readily, and in consequence the 'try, try again' method, known in comparative psychology as the 'trial and error method,' is the only one available. The evidence thus far in hand indicates that this is the all but universal method employed by animals in problem solving." *

Evidently low-level learning is wasteful of time and energy, and liable to fix bad habits on us. We should never adopt it if we can avoid it. But sometimes it is the only way; for some problems are like puzzles—we cannot think them out because no facts are furnished to serve as a basis for thinking. Even a detective must have some clue to his mystery. In such puzzle problems we must try more or less systematically until we succeed, and then note how the success came, so we can repeat it.

Unhappily many pupils, in their efforts to avoid thinking, fall into low-level learning. They not only repeat their tasks mechanically, but they guess carelessly at the words in the reading lesson, and figure their arithmetic problems this way and that in the hope that the answer will come out somehow. We should be able to convince them that it does not pay in the long run to learn by the "rat" method.

Mid-level learning.—Here we select some instinct or some old habit, and turn all its force toward the accomplishment of the new lesson. For example, if a dog has a hunting and chasing instinct, we may take advantage of it and train him into habits that make him a good caretaker of flocks and herds. His native tendency to paw out food and eat it can

* James Rowland Angell, *Chapters from Modern Psychology*, p. 260. Used by permission of Longmans, Green and Company, publishers.

be so modified by having him dig food from one's hand, that he will gradually learn to "shake hands" even when no food is offered. And once the habit of shaking hands is established, we can build on that the further habit of refusing to shake if one offers the left hand or has his fingers crossed. The animal trainer accomplishes practically all of his marvelous results by mid-level methods. *

With children, the instinct to imitate is so often used that mid-level learning is sometimes called learning by imitation. But many other instincts are employed, such as play, inquisitiveness, the collecting instinct, the desire to roam, the tendency to build and make. Old habits are also used as a basis for new ones. If a pupil in penmanship has learned to make good straight lines, angles, and ovals, we can easily teach him to make good letters.

High-level learning.—High-level learning is *thoughtful* learning. Ideas lead. Our chief dependence is on explanation, rather than showing. By the mid-level method the pupil learns from the hand up, manual before mental; by the high-level process he learns from the head down, mental before manual. This high-level, coldly intellectual process is one that teachers are in danger of using all too much.

Illustration and summary.—Suppose a child is to be taught to hold his pen, or inflect his voice, or use good English, or sing, or throw a ball, or swim, or use a saw, or perform any other act of skill: (1) he may be left to work out the puzzle alone by trying ten thousand times until he happens on some way that works fairly well, and drills it home; or (2) he may be given suggestions, shown how, told

* Angell's statement, quoted above, that animals learn almost wholly by trial and error, applies to animals when left to themselves, not when they have a trainer.

to "do it this way," "follow me," encouraged to build on the basis of some instinct or old habit; or (3) he may have the matter explained to him and then proceed to work it out in his own way.

We have seen that low-level learning is unintelligent, extremely wasteful of time and energy, and likely to fix bad habits. We should use it only as a last resort. The high-level process, while valuable as an aid, can seldom be used alone. There are few boys who, from the explanation of why a ball curves, as given in physics, can work out the best method of throwing curved balls. *Mid-level learning is the most general process.* We can readily see how essential it is that the teacher be able to perform in a masterful way whatever act of skill she attempts to teach. To develop similar ability in her pupils, she should rely chiefly on *imitation*, *suggestion*, and *sympathy*.

FOR FURTHER STUDY

1. Reclassify (if necessary) the samples of behavior called for in the exercise at the opening of this chapter.

2. Can a balky mule be truly said to have a strong will? In what terms would you describe him?

3. Why do we expect profound wisdom and effective action from those who talk little and are rather slow to act? "Even a fool, when he holdeth his peace, is counted wise." Explain.

4. Is one likely to find the right vocation by a process of trial and error? What is the right procedure?

5. How could a boy be educated into a good tramp, sport, or miser, if such were desirable?

6. Should most fifth-grade children acquire a mastery of fractions by a high-level or a mid-level process?

7. "We learn to do by doing." Show the truth and the error of this statement.

8. Make a list of ten of your habits—bad ones, if you have so many. What stimulus usually starts them? What supports you in your good ones?

9. Observe how those about you eat, talk, dress, etc. Do you think that most of their behavior is guided by reason, or by instinct and habit? Observe and report on some child in this respect.

10. What has heredity to do with determining the ease or difficulty with which a habit can be formed?

11. Can manual training be taught by lectures? Why?

12. Show how low-level memorizing differs from high-level memorizing.

REFERENCES

O'Shea, M. V., *Every-day Problems in Teaching*, Chs. VI, VII.

Pyle, William Henry, *Outlines of Educational Psychology*, Chs. IV–IX.

Rusk, Robert R., *Introduction to Experimental Education.*

Thorndike, Edward L., *Education*, Chs. IV, V, VI.

Yerkes, Robert M., *Introduction to Psychology*, Ch. XXIX.

CHAPTER XIII

THE LEARNING PROCESS

"How well he does the work, how rapidly he improves, depends, (1) upon how strenuously he keeps himself applied to the task, (2) upon the *learner*, the mental and physical condition of his organism. He must keep himself in perfect condition and strenuously applied to the work; the organism does all the rest." *

EXERCISE.—Write an account of how you felt and what you thought when you were learning something which has become "second nature" to you, such as skating, swimming, dancing, playing a musical instrument, curving a ball. This should begin with the first efforts and end with the finished feat.

Motives for learning.—If we wanted nothing we should do nothing. We all work most happily and effectively when we are getting what we want. Now what do our little workers want? What can we suggest to them as an incentive to learning?

We have already approached this problem, for it is closely wrapped up with the discussion of interest (see page 124) and of instinct (see page 131). We can hope to win anyone to action by appealing to his nature, his inborn *traits*, just as we can cause powder to go off by applying the spark its constitution demands. One works to beat a rival, another for gain, another for love.

It is impossible to take up here all the special and peculiar

* William Frederick Book, *Psychology of Skill.* Used by permission of the author.

traits that distinguish individual children, and which may even furnish their strongest motive to work and to learn. Such are the love of literature, or mechanics, or art. Browning loved Byron and began writing poetry almost incessantly at the age of six.

The teacher must deal with large groups of pupils, and so must often appeal to those traits which are likely to be strong in *all* children. These are the old racial traits called instincts. The racial traits have never been thoroughly and satisfactorily studied, but we can suggest a few which are usually so strong as to furnish a kind of key to the nature and activity of the average child.

Self-assertion.—To some extent, nature insists that each shall take care of himself. In the uncultured this trait may rule from birth to death. It is especially strong in the child. His native tendency is to snatch his food, slap his rival, claim all as "mine," resent interference, and be monarch of all he surveys. Herein lies the power of praise, rivalry, competition. The pupil who works alone is less likely to strive for success. This fundamental force in personality is perhaps the strongest to which we can appeal, and proportionately dangerous if abused.* But self-assertion may be good as well as bad.

Hero worship.—Feeling our pettiness and our lack of power, we turn to some one who is stronger. Children, who are all weak as compared with adults, cannot well do other-

* The picture of the student who ruins his health to win a prize is one often painted for us, and is not altogether untruthful.

Competition between groups may be equally strong and unreasoning. The principal of a high school in which there was competition between classes in the matter of attendance, found a group of boys about to haze a classmate whose proposed absence for a half day threatened to mar the perfect record of the class for that week.

wise. Your hero is what you hope to be. Through him you assert yourself,* achieving what you cannot achieve alone. The sanction of your hero means that you are on the way to success. You will probably find, in your own early education, that one of your strongest motives to the learning of anything was the fact that your parent or teacher, or some one else to whom you were strongly attached, approved that learning.

Try by every worthy means to make yourself the leader, the hero—but not merely the sentimental favorite—of your group of pupils. The personal influence of a thoroughly good teacher is not likely to become so strong as to make anyone complain about it.

Group spirit.—As the child wants his hero to succeed, so he wants his group, his kind, his "crowd," his "bunch," to win; for that means his own triumph. But in order to triumph with his group he must keep its favor, fall in with its spirit and habits. If he becomes very different from his fellows, both he and they will find it disagreeable. He gravitates to the group level, does as his group does. If bad conduct and failure in lessons are the exception, no pupil likes to furnish the conspicuous exception; † but in a school where low standards prevail, the good pupil is not likely to follow the lonely way of goodness overlong. It requires everlasting persistence on the teacher's part to keep the group level high.

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* Hero worship may almost be called indirect self-assertion.

† Perhaps this is not true of a few bold spirits who like to pose as leaders, start a rebellion, and set new standards of conduct for the group. The best way to deal with them is not merely to suppress them by punishment, but to show ourselves better leaders than they and draw their forces away from them. A would-be leader left without followers is a sorry sight.

Imitation.—Sing into a harp or a piano and it will sympathetically reproduce your tone. Our nervous systems are capable of a somewhat similar sympathetic response. Perform any act in the presence of a pupil, and if he "has it in him" to do that deed, he is likely (other things being favorable) to attempt it. The world is waiting to reward those teachers who do not merely stand back and tell pupils what to do, but who are able to say, at every point, "Follow me. Do as I do."

Play.—This hardly needs discussion. That the play trait is strong is shown by the vast amount of time most children gladly spend in play. Whatever can be put in the guise of a game arouses ready enthusiasm.*

Curiosity.—As said before (page 125), we are all curious by nature. "How will it turn out?" and "What does it mean?" are the questions that carry us through thousands of pages of fiction and of history, and give zest and interest to the commonplace affairs of everyday existence. They can be made to give life to many a lesson.

Constructiveness.—Perhaps most of us think the child has more *de*structiveness; but he tears down largely for the purpose of satisfying his curiosity and enabling him to build again. His building may be homely and crude, but it is *his*. When we reflect on how much *we* have learned from our efforts to build and to make, we can see why we should give this impulse full play in the schoolroom.

Other motives.—The above are some of the oldest, strongest, and most common traits to which we can appeal to arouse interest in a lesson and "get up steam" for its learning. But the open-eyed teacher will discover many others,

* For suggestions along this line, see *Natural Education*, listed in the References at the close of the chapter.

such as the rambling impulse, so valuable in the study of geography and botany; and the collecting craze, which may lead to the accumulation of all sorts of specimens for the school museum. Moreover, special traits, such as the love for nature study or music, are sometimes stronger in individual children than the old racial traits, the instincts.

Value of expressive learning.—The title of this chapter, "The Learning Process," includes much that has already been covered, such as perceiving, remembering, imagining, and thinking. But such learning was previously treated as passive, *receptive.* In discussing "levels of learning" and "the learning process," the aim is to lay emphasis on the value of the active, *expressive* side of the work. Learning is sometimes defined as "change of behavior, due to experience." If this is right, then no matter how much one has committed to memory, we can hardly say he has really learned anything unless it makes a difference in the way he behaves.

"Who learns and learns, but acts not what he knows,
Is one who plows and plows, but never sows."

Expression clears up our ideas, makes them exact, gets them jointed together. If you want to find out whether you really know anything, try to express it. "Reading maketh a full man, conversation a ready man, writing an exact man." Most of us are too intent on getting "fullness," too little on being exact. Draw accurately or make some object, such as a kite, and see how much you must improve your knowledge of it before you can finish the task. Expression shows us our weak points, and stings us into the resolution that hereafter there shall be no weak points.

Further, it is only by expressing ideas, with tongue, pen, brush, chisel or what not, that mind can make itself known

to mind. No one can enter his neighbor's head and catch a thought; he must wait till it comes out. Whoever cannot learn to express himself in some form must be content to remain walled in from the world to the end of his days.

When any form of expression, such as playing an instrument, writing, or saying the multiplication table is perfected into an act of skill, it yields especially valuable results. "Practice makes perfect," but just how? We gain (1) in accuracy; (2) in speed; (3) in ease of performance and freedom from fatigue; (4) in confidence and pleasure in our ability; and (5) in the freeing of our mind for other matters. The practiced act almost performs itself.

Schoolroom practice demands the teaching of many acts of skill. We should understand the process in detail.

The acquisition of skill.—This means, of course, the forming of habits, but regarded from the *mechanical*, rather than the *moral* standpoint. Habit forming as an element in character building will be considered later (see Chapter XXVI).

It is found that those learn fastest and most easily who for some reason *want* to learn. Accordingly we should study our learner and appeal to that good motive which is most likely to stir him to action. Some of the more common motives we have studied in this chapter. Perhaps it is best if we can make the pupil feel that he is going to need this learning,—skillful penmanship, good reading, or what not, —and need it soon.*

* Many, probably most pupils need no special appeal; they will follow the teacher without question wherever she leads, so long as her own interest holds out. But we should know how to "pull the strings" of a pupil's desires, in cases where it becomes necessary. On the other hand the little rebel's most natural question, "What good is it?" may open the teacher's eyes to the fact that she is teaching many things which really are of no value.

We should then follow the steps outlined below.

1. Study the learner, and choose the method, low-, mid-, or high-level, that is best adapted to him. The animal must learn by trial and error, or by the adaptation of some instinct; young children and stupid grown folks learn most readily by play and imitation; very bright children and intelligent adult learners should be approached through the medium of *ideas*, should have things explained, be made to *understand* as a preliminary to the acquisition of skill. Here enters real *teaching* as compared with the *training* which alone is possible on the two lower levels.

2. Make the process clear in the beginning, and see that it is practiced correctly. It is easier to form new good habits than to break up old bad habits. If the act of skill is a complex one, such as writing, the teacher should:

(1) Analyze it into simple parts.

(2) Teach each simple part thoroughly.

(3) Combine these simple acts into one whole finished performance.

Thus in penmanship, we must teach: (a) bodily position, (b) arm movement from left to right, (c) arm movement at right angles to the base line, (d) paper holding, (e) pen holding, etc., combining these simple acts, when each is reasonably well learned, into the finished performance of writing.

If any "hitches" are discovered, *concentrate on them until they are mastered*. This saves much monotonous repetition of the whole performance.

3. Keep the mind of the learner on the goal to be achieved. This goal should be an *accurate and finished* product. It is found that those learners are most successful who work with attention at high pitch, and who assume during practice the "do-or-die" attitude. Such fixation of

attention keeps one from becoming "rattled." Moreover it helps the learner to avoid two ever-besetting dangers: (1) going too slowly and so becoming "set" on a low plane of achievement; and (2) going too fast and so falling into and practicing errors. To avoid this latter danger it has been proved best to practice most of the time for *accuracy*, and occasionally only for speed. The speed will take care of itself, for the most part.

It is noteworthy, too, that this centering of attention on the goal promotes the unconscious, apparently accidental discovery of improved methods, which can later be consciously adopted. *

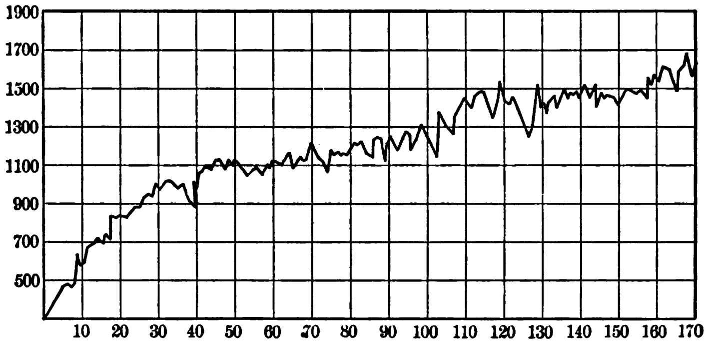
4. Keep up the learner's self-confidence and general good spirits by pointing to his successes and otherwise, especially during times of slow progress. Too intense stimuli impede the learning of animals; and it is probable that caustic criticism, sarcasm, or any other excessively intense stimulus impedes the progress of the average human learner also.

At the beginning of practice, learning is more rapid than at any later period. But when this first flush of conquest is over, it is quite usual for curves of learning (figure, p. 146) to show "plateaus," long periods of even forty to fifty days, during which there is no progress and in which there may even be retrogression, in spite of continued practice. Besides this there are more numerous brief periods of a similar nature, each lasting but a few days; and one must even re-learn each day, to some extent, what was "learned" the preceding day. Moreover, the more closely one approaches

* Everyone, if he keeps watch, will find himself happening upon new and better ways of lacing or buttoning shoes, brushing teeth, combing hair, and the like. He should then take advantage of these new tricks and deliberately practice them. So it is with all acts of skill.

the limit of achievement, the longer and harder must he work for each added unit of efficiency.

The learner should know that we all have to pull against



Curve showing rate of improvement in typewriting. Figures on the horizontal axis indicate number of days of practice; those on the vertical axis show number of strokes per ten-minute period. Notice the long "plateaus." (From *Psychology of Skill*, by W. F. Book.)

such discouragements, and if he cannot avoid them,—some can do so in part, largely by keeping their nerves in fine condition,—he should be encouraged to endure for a time, for salvation always appears in the form of another rapid rise in the curve at the end of the plateau.

"The feelings were a perfect index of the learner's psycho-physical efficiency and of how his attention was working," says one experimenter, "and always had a stimulating or retarding effect on every part of the work." Also, "Close attention to the work, success, improvement, and a pleasurable feeling tone always went together." * Of course, as the author remarks, the feeling may have come from the success, or the success from the feeling, or both from something else; but it is very likely that good feeling promotes efficient learning.

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* William Frederick Book, *Psychology of Skill*, pp. 177, 73. Used by permission of the author.

5. Take every advantage of the good days, and make allowance for the bad ones. Intense effort at favorable times will scoop out new and more effective nerve channels through which the currents will thereafter flow with ease. Whoever by a master effort can excel himself is likely to find such excellence a permanent acquisition. The rate of learning must be suited to subjective and objective conditions. On bad days the rate of performance may sink to one half the best record, or even lower, and it is unwise to force matters: "On a bad day when spontaneous attention is relaxed it is profitable to drop down to a lower plane of work, one sufficiently low for the work to be done correctly. Only on the good days is it profitable for the learner to 'sprint' or try hard to push himself onto a higher plane of work." *

As soon as the pupil can profit by the knowledge, teach him the art of self-examination and self-direction. In addition to the general art of self-teaching, there are many personal "tricks" which will add much to the pleasure and profit of learning.

The importance of rest, recreation, good hygiene generally is easily apparent. To sum up in the words of Book: † "How well he does the work, how rapidly he improves, depends, (1) upon how strenuously he keeps himself applied to the task; (2) upon the *learner*, the mental and physical condition of his organism. He must keep himself in perfect condition and strenuously applied to the work; the organism does all the rest. He needs but consciously to lay hold of and make proper use of the adaptations that are unconsciously fallen into, the habits and associations formed.

* W. F. Book: *op. cit.*, p. 175.

† *Op. cit.*, p. 181. Used by permission of the author.

All this suggests that if one wants to improve at the most rapid rate, he must work when he can feel well and succeed, then lounge and wait until it is again profitable to work. It is when all the conditions are favorable that the forward steps or new adaptations in learning are made. Whether the older associations are at such a time also more rapidly perfected, or whether monotonous practice will answer as well in stimulating their growth, we cannot say."

Formal discipline: educational transfer.—In the gymnasium, a student can develop strength and skill which he can then put to use in many different directions. He gains such development through a course of a few general exercises. Can there not be a mental gymnasium? Formal discipline is the exercising of the mind on a few chosen branches, with the object of arousing and developing, through them, every mental faculty.

There is much truth in this doctrine, but not so much as our forefathers in education supposed. They expected to develop "the" reason through mathematics, "the" imagination through the classics, "the" memory through history. But the psychologist fails to find any such general faculty as "the" memory, for example. Each of us has a group of *special* memories, a good memory for figures, a poor one for faces, and so on; and history reaches but one of these special memories mainly, the memory for history.

Still, the reading of Latin undoubtedly makes one more skillful in reading French. Such carrying over of efficiency from one kind of performance to another is known as "educational transfer," or "transfer of training."

Many of the problems involved in formal discipline and educational transfer are as yet unsolved. It seems evident that learning to swim will not teach one to play a piano.

Yet when the first typewriter was made the manufacturers advertised for an operator who could play the piano. This points to the first method of transfer, by (1) *identical elements:* pressing typewriter keys is much like striking piano keys; Latin words and French words are similar. It is probably true also that transfer is aided by (2) *ideals.* Neatness in language work may develop an ideal of neatness which affects all written work, provided this general ideal of neatness is *deliberately encouraged* in the pupils during the language teaching. Here we seem to appeal to a higher brain center which controls many lower centers. There is, then, such a thing as transfer, but no such thing as complete, hundred per cent transfer. Very likely the per cent of transfer increases as we rise from low-level through mid-level to high-level learning, and one would expect it to be affected greatly by the inborn abilities of the learner; but experiment has not determined these points.

Thorndike is right in his contentions that (1) "it is extremely unsafe to teach anything simply because of its supposed strengthening of attention or memory or reasoning ability or any other mental power; when a teacher can give no other reason for a certain lesson or method of teaching than its value as discipline, the lesson or method should be changed." Also, (2) "that intelligence and care will be necessary to secure from any subject what disciplinary value it does have; we cannot expect that the mere fact that a certain subject is taught somehow will surely result in securing the disciplinary value which it may have when taught properly." *

Fatigue.—In the first place we must distinguish between

* Edward L. Thorndike, *Principles of Teaching*, pp. 242, 243. Used by permission of the author.

being fatigued and feeling tired. Fatigue is a real lack of mental or muscular energy. The powder is all exploded. Tiredness is a feeling which usually accompanies such lack of energy, but which may be present when one is not fatigued. There is powder enough, but we feel indisposed to apply the spark. One who observes us can often judge, better than we ourselves can tell from our feelings, whether we are really fatigued. The teacher may know, better than do her pupils, whether or not they really need rest.

Dr. D. M. Taylor's description of the fatigued child is instructive. The picture of a fatigued child, he says, is characteristic—the tired, drawn look, the clumsy movements, his listless conversation, his aversion to exert himself, and his readiness to fall asleep. When the condition is becoming a chronic state another set of signs begin to manifest themselves, and the morning finds him sleepy and languid, his eyes dull, his pupils large, and his expression wearied. He drags himself to school, without alertness, his walk is "tottery" and awkward. In school he lacks attention and responds feebly, his gaze wanders, he is slouching in attitude, and he becomes peevish. The same causes continuing to act, matters become aggravated, and he arrives at the borderland of actual disease. He is pale and pinched, he suffers from headache, there is muscular twitching or incoördination, and he is susceptible to colds and to infectious disease; stomach troubles ensue, with loss of sleep, and exhausting dreams.*

The *stages* of fatigue are fairly well marked. In the first stage, quantity of work increases, but quality decreases; next, quantity also falls; finally comes exhaustion, or else a condition called fatigue-fever. In fatigue-fever, the desper-

* Quoted by Rusk, p. 207. See References at close of chapter.

ation of the worker causes him to throw off an increased quantity of work; but the quality of it is poor, and his own physical condition is shown by his weak, rapid pulse, quick and shallow breathing, and uncertain movements.

Common sense is borne out by the finding that whatever has been reduced to automatism is comparatively unfatiguing; that work not suited to our natural powers, or which is very disagreeable to our inclinations, fatigues us rapidly; that physical work causes mental fatigue; that even light work, when our energies are low, may be more injurious than heavy work when energy abounds; that the failure of memory and attention are among the first effects of mental fatigue.

Studies of fatigue indicate, with regard to school programs, that it would probably be wise to take two half holidays, on Wednesday and Saturday afternoons, instead of a whole holiday on Saturday; that if afternoon sessions are retained the midday intermission should be as long as possible; that the energy of the child is highest in the morning, decreases until noon, rises to its second highest point some three hours after the noon meal, and then gradually ebbs to its lowest. The school subjects, arranged in the order of their fatiguing power, are arithmetic (most fatiguing), gymnastics, music, language subjects, realistic concrete subjects, and work involving the use of tools and shop materials. The pupils who are most susceptible to fatigue are the mentally and physically backward. Although liability to fatigue decreases with age, so that longer instruction periods may safely be used in higher grades, yet it is in the higher schools that most cases of fatigue injury have been found. William Henry Pyle says in his *Outlines of Educational Psychology* that as far as any im-

provement is concerned, drill work should stop short of considerable fatigue, in fact should stop as soon as fatigue is noticeable; and that as far as economy of work is concerned, there is little use in trying to learn after fatigue has become considerable.

Fatigue among teachers has received little attention. Very likely most of us do not rest with sufficient *frequency*, *brevity*, and *abandon*. Very likely frequent short rests and vacations, surrendered to whole-hearted recreation, would obviate the necessity for long interruptions in our work. But if as teachers and pupils we daily recover from each day's work, we have the problem solved in a practical way at least.

FOR FURTHER STUDY

1. Learn the following: (a) Place the tip of your right thumb against the tip of your left forefinger. (b) Above this pair, place the tip of your left thumb against the tip of your right forefinger. (c) Separate the pair first joined, bring them above the second pair, and repeat (a). (d) Separate the second pair, bring them above the other two, and rejoin them.

Repeat the whole process until you can easily keep it going at a good rate of speed.

Recall your feelings as you learned it.

2. Perform the above exercise rapidly before a group of children or adults and ask them to do it. Notice the awkward attempts, with here and there a success. Then, *show* them carefully, one step at a time, giving clear directions, somewhat as above. Do they catch the idea?

What does the exercise show?

3. We teachers forget our old struggles to learn, and so grow impatient at the slowness of our pupils. If you want to appreciate their struggles, try buttoning buttons or

writing, with the hand you do not usually use. Even this is less difficult than learning something thoroughly new.

4. Try to discern the motives of those about you, especially children: why do they do what they do? Test whether the motives listed in this chapter are really the most important.

5. Tell how you would form in your pupils the habit of doing neatly the work to be handed in to you; of maintaining quiet during the study period; of coming to school on time. On what instincts could you base these habits?

6. Is it mere *blind* practice that "makes perfect"? What does? Show how this involves levels of learning.

7. What instincts or other traits can we take advantage of to help a child to learn to read and write?

8. Would you advise a high-school student to study Latin and Greek because of their "general disciplinary value"? Why?

9. Recall your own school days. Make a list of the chief motives that led you to learn. Do you think your chief motives were those of your classmates also?

10. One reason why people swear and use slang is because they have never learned to express themselves easily and freely in any other way. Do you believe this? Discuss it. What other motives probably operate in such cases?

11. If mathematics develops a general power of reasoning, why do we not choose expert mathematicians for all responsible positions?

12. Study yourself a bit when you are fatigued: note the peculiar pull of the mouth muscles when you try to smile, the postures you naturally take, how you walk, the appearance of your face in the glass, especially the expression of the eye; notice the effect of fatigue on your temper, and on your work. Observe others, especially children, and try to discover when they are fatigued. Do you find them quick to admit it?

REFERENCES

Book, William Frederick, *Psychology of Skill*, etc.

Colvin and Bagley, *Human Behavior*, Chs. X, XI, XVII.

Colvin, Stephen Sheldon, *The Learning Process*.

Pyle, William Henry, *Outlines of Educational Psychology*, Ch. XV.

Rusk, Robert R., *Introduction to Experimental Education*.

Stoner, Winifred Sackville, *Natural Education*.

Swift, E. J., *Mind in the Making*.

Thorndike, Edward L., *Principles of Teaching*, Ch. XV.

PART THREE

METHOD AS RELATED TO THE TEACHER

CHAPTER XIV

KINDS OF LESSON AND HOW TO TEACH THEM

"The result is that independence and self-reliance, either of reasoning or observation, and the spontaneous love of nature which these spring from and engender, are not encouraged by the school, and in some cases are actually blighted by its influence. Secondhand knowledge is peddled out by the teacher in the shape of laboratory directions, in lectures, through a textbook, or in catechetical form. The appeal for facts is not made to nature but to the teacher, who, when he gets as far as asking the pupil what he thinks, frequently furnishes the conclusion ready-made by telling him whether he is right or wrong. In such conditions, instead of studying nature the pupil is studying, in stupid and roundabout fashion, the mind of the teacher, and is not being helped to investigate for himself. If, on the contrary, the facts are sufficiently convincing, the pupil does not ask the teacher whether the idea is right or wrong.*

EXERCISES.—Before reading this chapter, visit several classes and record the various purposes which you conclude the teachers are trying to attain, such as the acquisition of an act of skill, the ability to think, etc. Try to draw up a list of all possible kinds of lesson.

Review Chapters VII, IX, X.

Kinds of lesson.—We must let the children show us how to teach. If we want to know all the kinds of lessons to be taught, we must ask how many kinds the pupil can *learn*. This we can discover by a glance at his mental and bodily abilities.

* Colin A. Scott, *Social Education*. Used by permission of Ginn and Company, publishers.

Abilities	*Lessons*
To perceive To remember	Lesson for Information
To imagine To think	Lesson for Thought
To feel	Lesson for Appreciation
To acquire skill (mental or muscular)	Lesson for Skill

Whenever a child is learning, he is using some one (or more) of these abilities; and as we have studied them, we already know a great deal about the lessons based on them. The first two kinds of lesson suggest our discussion of the mind as a factory. When a child perceives and remembers, he is collecting and storing mental material; when he imagines and thinks, he is combining such material. The lesson for appreciation aims to educate the feelings. The lesson for skill explains itself.*

THE LESSON FOR INFORMATION

Purpose and value.—The purpose of the information lesson is to gather and store mental material. Sometimes this is done for pure pleasure. One is glad to learn the amazing structure of a snowflake, even if he never makes

* All four kinds of lesson may appear in a single class exercise. For example, during a period in the manual-training shop pupils may (1) acquire information about the saw; (2) think out the problem of why its teeth are shaped as they are; (3) learn to appreciate what this tool has done and is doing for us; and (4) practice for skill in the use of the saw.

But for the sake of clearness, it is well that we here consider each kind of lesson separately.

practical use of the knowledge. But pupils are apt to pick up such pleasure knowledge for themselves, if they are given the chance. Whatever they acquire with effort should be taught from the standpoint of *future use*. We should not try to make walking encyclopedias of our pupils. The aim of the information lesson is to furnish the most valuable facts which are likely to be used, and for the most part used soon, for some large purpose, such as thinking, or the shaping of an act of skill, or the guiding of practical conduct, perhaps caring for health.

The value of mere information is commonly overestimated. In the vulgar eye information is education. But it is often the backwoods philosopher who reads everything, knows everything, and does nothing. It is not what the factory takes in, but what it turns out that gives it value. The pupil cannot stock his mental storeroom once for all. He must learn to gather facts as he goes along, and to gather them in the light of *need*. Instead of fact stuffing, he should acquire *locative* knowledge, that is, knowledge of where facts are to be found, in books of reference, among people, or in the natural world, so he can find his material when he wants it. No good carpenter carries a lumber pile on his back.

The teacher, too, may make the mistake of accepting from pupils mere information, or the blind repetition of book language, as sure evidence of thought or of the possession of skill. Judged by this standard, phonographs and parrots are well on the way toward meriting a diploma! One may practice so mechanically the habit of repeating or copying, that he has no clear idea of what he has repeated or copied. We can probe such a case by cross-questions, or by the test of action, requiring the pupil to tell or show how to apply his knowledge.

What should be committed to memory?—In answering this question, we must keep clearly in mind what we commit to memory *for*. The pupil should not make a mere garret of his mind by stowing it full of odds and ends that he *may* want to use sometime. He should learn that which is useful—which is *most* useful.

What facts from our elementary education do we adults retain and use? The spelling of common words, a half dozen language rules, a few arithmetical principles, with addition and multiplication tables, a very limited number of dates in history, names of rivers, cities, etc., in geography, with the major facts of physiology and hygiene. These are the chief things—and the list is not long.

"But we actually make use of many principles, laws and facts not found in this brief list, even though we do not hold them in memory in verbal form." Of course, and this seems to show that our children should form more *habits* and do less memorizing verbatim. This means more practice in *doing* and less time spent in committing and repeating.

Method in the information lesson.—We have already learned (see Chapter VII) that the most impressive way of gaining information is to "get at the real object whenever possible." We have found that some of our experience, as that of colors, tones, and other sense impressions, *must* be gotten in this direct way if it is gotten at all.

If we cannot get at the real object we resort to the most realistic substitute for it, a model, picture, map, diagram, or the like. The substitute may be better than the real object, if the object is very great, very small, or very complex. A model of the solar system or a picture of a blood corpuscle may give more and clearer information than a pupil can obtain from the originals.

Reading and the lecture * furnish quick ways of massing what we may call secondhand information. We must see to it that the learner has a sufficient apperceptive basis for the understanding of what is heard or read; and he should *do* something from time to time to show that the book or the lecture is not soothing him to sleep instead of arousing him to action.

Whenever thorough, scientific information is wanted, it is well to (1) analyze the object of study, (2) note the relations of its parts to each other, and (3) synthesize, reconstruct it.†

THE LESSON FOR THOUGHT

Follow scientific method.—Since the scientific spirit and ways of working have won for man his most striking successes (see Chapter I), we should encourage this spirit and method among our pupils. The little truth seeker in the schoolroom and the great scientist in his laboratory should follow the same steps; but the scientist takes each step consciously and deliberately, while the pupil may merely imitate his teacher and develop what we may call the habit of correct and careful thought. Deliberate, independent thinking is likely to come late, with maturity.

Let us review the steps in scientific method and see how our lessons correspond with them.

Lesson for Information	1. Getting a definite question to answer 2. Collecting facts

* See p. 174 for a discussion of the lecture method.

† Analysis and synthesis are discussed further in the following chapter (Chapter XV).

Lesson for Thought
- 3. Generalizing
- 4. Forming hypotheses
- 5. Testing to find the true hypothesis
- 6. Using the new truth as a basis for further reasoning

It appears that we are not really ready to solve any problem until we have it stated definitely, and have gathered a respectable array of facts that bear on it.*

Generalizing is an everyday necessity; no one cares to handle straws, or eggs, or facts, one at a time. We bale our straw, crate our eggs, sum up a thousand scattered facts in a single general statement. Because of the large business we do with facts, some such wholesale method is forced upon us. Consequently we fall into the habit of it; and again, consequently, we are likely to make many general statements that are loose, reckless, and untrue.

Children do this almost daily. The little Republican concludes that "all Democrats are dangerous." Another may maintain that curly-haired men are dishonest, or that "snakes poison you,"—some do,—or that the northern lights cause war. This childish habit comes partly from imitating elders, partly from the narrowness of a very limited experience. We must widen the experience, and break up the habit by forming the better one of being careful about what we say.

A hypothesis is an attempted answer to the "definite question" with which we start. Most of what has been

* How often do we argue at length, only to find, at the end, that we and our opponents have been talking about different propositions! We should state the question before we debate it. Sometimes, too, we plunge into a discussion with more feeling than fact to support us.

said of generalization holds also of hypothesis; for most hypotheses *are* generalizations. Children, like adults, dodge the facts and jump at conclusions. A better way would be to jump at the facts and dodge conclusions for a time. School your pupils in testing out their theories to the limit of their knowledge. "The earth is flat." Good: hold to your opinion if you can; but explain why a ship disappears hull first as it goes out to sea, and why the earth's shadow on the moon is round.*

Devices for stimulating thought.—The good old-fashioned debate is always in order. Many a topic divides a class into two camps, and it is well to let it stay divided for a time, if the subject is one that will not engender bad feeling. The teacher, with serious face, may suggest some false but common statement and let the class point out and prove its error. He should keep the argument orderly and progressive, curbing the "smarty" and encouraging the timid.

Questions may be given out, or if they appear incidentally in the lesson, reserved, with a challenge to find the answer overnight. At any time, following the grinding out of a grist of facts, pupils may be urged to bag their grist by

* At this point, it is easy to distinguish (if anyone wishes to) between inductive and deductive reasoning. The first four steps in scientific method as outlined are inductive. Induction is the procedure from particular facts to a general truth. A dies, B dies, C dies, etc. Hence the general truth, "All men are mortal." Deduction is the application of a generalization to particular facts. "All men are mortal." Well, then, I know what will happen, some day, to Jones, Smith, and the rest of my neighbors.

But if we are in danger of falling we do not argue as to whether we shall stand on our feet or hang by our hands; the essential thing is that we have reliable support of *some* kind. So the essential thing is not to discriminate nicely between induction and deduction, but to know that our statement has reliable support of some kind.

It is desirable that all teachers have training in logic, and in practical, friendly argument.

including all in a single generalization. Numerous problems from daily life will draw out many hypotheses. Why do birds come back in the spring? Why do leaves turn color? Why do bubbles go up if you attach the bubble blower to the gas jet? Pupils persist most doggedly on the trail of those questions which are not artificially made by the teacher, but which bear on their daily life, interests, and occupations.

In every critical case we must compel the pupil to back up his assertions, make him understand that noise, bluster, positiveness, will not take the place of fact. Socrates was right. That man is most eloquent who tells the plain truth. There are three test questions which it is well to apply to every important statement: 1. Just what does this mean? 2. Is it true? 3. How do I know?

FOR FURTHER STUDY

1. Do you not think the "Lesson for Imagination" should receive special treatment? If so, devise some exercises for such lessons.

2. Under what circumstances should the material to be committed to memory be selected by the pupil?

3. Which would you prefer to have a pupil do in any given lesson, think vigorously and reach a false conclusion, or proceed lackadaisically and chance upon a correct result? Why?

4. Outline some thought problems that can be solved by a fifth or sixth grade.

5. In a certain school each pupil was in turn permitted to find and name a city on the map,—it was usually a small town,—after which the others hunted till they found it. Criticize this.

6. A class commits to memory thoroughly many facts

and definitions; the superintendent gives a test requiring considerable thought; the class fails. Who is to blame?

7. Criticize the lessons for information and for thought that were taught you in your elementary school days.

8. It was once thought that pupils should spend their early years collecting and memorizing facts, and their later years in thinking, based on those facts. Is this true? If not, what is true?

9. Outline (1) an information lesson on "Slavery in the United States," and (2) a lesson for thought on the same topic. How do they differ? In which grade could each be given appropriately?

10. Recall, if you can, some false generalizations, from your childhood days. How came you by them?

11. If a thoughtful mind is like a running factory, a mind that is merely stocked with information is like a storehouse, where nothing moves, and the owner can take out only what he put in.

1. Just what does this statement mean?
2. Is it true?
3. How do you know?

12. State some definite problem in pedagogy, such as: How can my pupils memorize spelling more rapidly, from the board (each word being written, erased, and then visualized), or from their books? Following the steps in scientific method, tell in some detail how you would proceed to investigate this problem.

Having obtained an answer, could you be sure that it would hold for both girls and boys? For pupils of other ages? For any individual pupil in your room?

REFERENCES

See References following Chapter XV.

CHAPTER XV

KINDS OF LESSON AND HOW TO TEACH THEM (Continued)

EXERCISE.—Review Chapters XI and XIII.

THE LESSON FOR APPRECIATION

Purpose.—The lesson for appreciation aims to arouse feeling and to direct it; to make the heart thrill, and to get that heart set on things worth while. We can see two objects then: (1) pure pleasure, and (2) the forming of such likes and dislikes as will serve to control conduct, make the impulsive pupil see that the straight and narrow way is the through road to blessedness.

(1) One can learn to find pleasure in almost every moment, object, and event. The school should cultivate a sensitivity of soul to every beauty about us. It is wrong to spend all our time scientifically analyzing and classifying birds and blossoms; we must learn how to relax and revel in the pure enjoyment of them.* So with art as well as nature; music must not always be twanged out in fractions, nor painting be gauged by the rules in the book, nor poetry appreciated by the foot. What seems companionable to us should be bosomed and carried home and domesticated.

* School means, literally, leisure. It should certainly furnish leisure enough for the enjoyment of nature, music, poetry, pictures, literature,—all that is good.

Throughout life, each should have his own household gods and joy in their service.

Practically, one of the large functions of the appreciation lesson is to teach the wise use of leisure. In the case of many individuals, it is fully as important to teach them how to seek pleasure rationally during those *free* hours when their salvation depends on their own insight and self-direction, as it is to develop a vocational skill which will be exercised under the constant oversight of a foreman. Nights of pleasure are much more dangerous for most of us than days of work.

(2) Our lighter feelings may seem as capricious as the winds and waves, but our deeper sentiments ebb and flow like great tides, fairly well fixed in their behavior. How much would it take to destroy our love of country or home, our attachment for church or friends, our devotion to our work or even to an ideal! History, literature, moral training,—every branch should work to turn the currents of the child's affections toward the true, the beautiful, the good.

The lesson for appreciation then is not always a mere pleasure lesson, or enjoyment lesson. A funeral is often an effective appreciation lesson. We must learn to assign a proper value to the sad, stern things of life, such as poverty, vice, and crime, as well as to more agreeable experiences.

Method of the appreciation lesson.—We cannot create feeling at command. That is why so many well-meant exhortations are so useless. The empty command to "love the flag" would never make devoted patriots. Our feelings follow our perceptions, ideas, and acts, clothing and beautifying (or uglifying) them as flesh and skin clothe and grace the skeleton. We must control the feelings by controlling

the perceptions and ideas that underlie them. There are two effective ways of doing this, (1) by contemplation, and (2) by participation.

(1) Contemplation serves to hold the cherished object in mind and let the associations play about it, each new suggestion bringing its tributary rill of feeling.* So we may contemplate a picture, a poem, a landscape, a memory, an ideal, until its beauties blossom in our souls. The teacher's work lies in bringing her pupils into the presence of these beauties, and in calling attention to them, arousing affective associations in connection with them.

(2) Participation in any kind of activity is likely to enrich feeling. While a study of the history and meaning of our flag is likely to arouse affection for it, yet he who has served under the Stars and Stripes feels for the old flag a love such as mere contemplation can never engender. As teachers, we must try to get our pupils active in the cause we would have them support. Indeed, psychology teaches that it is mentally unwholesome to arouse emotion without giving vent to the emotion in action.† One aim of the appreciation lesson is to form ideals; and an ideal formed without action is likely to lack the vitality that comes from exercise.

Imitation forms a strong motive to appreciation. Feeling often flows like magic through a group, and the larger the number affected, the stronger is the mass effect on each. Let the teacher show heartfelt admiration for a work of art or an unselfish deed, and she will excite a similar admiration

* A jeweler tells me he can spend a happy hour examining a good diamond with a microscope. He is no miser, but a man of strongly æsthetic nature.

† To quote Elbert Hubbard: "Motion must equal emotion."

in her pupils. But she must take care; let her simulate, act, gush, and she may only arouse their disgust.

THE LESSON FOR SKILL

What acts of skill should be acquired?—As the acquisition of skill is costly in time and effort, we should know, first, the purpose and value of such acts. (1) Certain skills, such as buttoning clothes, buttering bread, writing, and using the mother tongue correctly, are required of all. (2) Other skills are necessary to future acquisitions. Examples are the mastery of the alphabet and the multiplication table. (3) Special skills are demanded in the various vocations. It would be difficult to catalogue the particular acts of skill to be taught in any school, but it should not be difficult for the teacher to determine in any case, whether a given skill is worth to a certain pupil the labor of acquisition. A graceful walk is important; dancing is less so.

Drill.*—Probably the most difficult part of this process lies in obtaining sufficient drill without making the process wearisome by its monotony. Perhaps this is due in part to the fact that the old-fashioned drill was blind, long, and unvaried. The drill period should be short; for young children, not more than ten or fifteen minutes. It requires a strong and fairly mature nervous system to withstand a half hour of rapid drill without undue fatigue.

A proper distribution of drill periods will insure the desired results. Better two fifteen-minute periods daily than one thirty-minute period. Better two thirty-minute periods or three twenty-minute periods for grammar and high-school pupils than an hour of solid work. Regularity,

* A suggestive drill lesson is found on page 197.

too, is a factor. The student who settles down to his practice at eight o'clock each evening will far outstrip the brilliant but intermittent worker. While there is a legitimate lounging time in the learning process, too much reliance on it is likely to establish the habit of laziness.

The drill should be varied in detail, though the fundamental process must not be changed. Six times seven are forty-two: we can tap on the floor six times with a pointer, each rap standing for seven; or let the combination appear on one of a series of cards; or put it into a problem; or let pupils base a story on the fact; or write it in red crayon; or add a column of six sevens, etc. The best process, of course, so long as interest can be maintained in it, is the one most like that of actual life. So the drill in spelling should be mainly written, the drill in language mainly oral. For this very reason we should have much more drill than at present in *rapid*, *silent* reading, followed by an oral report.

Further (as has been stated before), the most difficult parts of the skill act should be isolated for special drill. The most difficult words in a series of lessons, the hardest combinations in the multiplication table, the most important dates in history, and the like, should be listed and drilled, to the comparative neglect of the easy and unimportant.

But the easy and comparatively unimportant must not drop totally out of sight. When a series such as the multiplication table is to be drilled upon, it is well to have each item on a separate card, or otherwise isolated, to make sure that, in our random skipping about, no part is entirely neglected.

The pupil's errors should be corrected persistently; in fact, we should in most cases prevent his making them if we

can. The marksman who misses the target improves much more rapidly, if he is told where he does hit. The pupil should be told, one item at a time, just what he is doing that he ought not to do, as well as what he is not doing but should do, and then he should be given the correct form. This is the main reason why concert drill is bad; in many subjects we cannot discover and correct individual errors. We must keep the ideal clearly in mind, or our practice is vain. As White well says, *Repetitio mater studiorum* becomes *Repetitio mater stupidorum,** unless we work under the inspiration and guidance of clear ideals.

Greater than the details of the process is the determined attitude of the conqueror. Keep the picture of success vividly before the pupil, and if he is made of the right stuff he can endure anything. The fact that he will not endure hardship is a severe reflection on him. The best incentive, wherever it can be appreciated, is the vision of the result in terms of efficiency.

METHODS COMMON TO ALL LESSONS

Oral and written work.—Those teachers are very rare whose tendency is toward too much oral work. From the time the pupil learns to print or write, all the way through his university course, his labors with pencil and pen are likely to interfere with his education. Turning to life outside of school, we find that few adults do much writing: even the arithmetic of everyday life is largely oral, and none records his history, or geography, or physiology. If we consider the amount of talking we do as compared with our letter and other writing, it appears that even in language

* "Repetition is the mother of learning" becomes "Repetition is the mother of stupidity."

work we may well ease finger cramp by working the tongue muscles. The future for which we are preparing most of our pupils is not so much a *writing* future as a *talking* future.

True, the school may have ends of its own that justify much writing, but the burden of proof is certainly on the advocate of the pen. If it is urged, for example, that all can write at one time, whereas not all can talk at once, we may reply that all can listen, all can think at one time; that the stimulus of new ideas is much greater than when each sits isolated by silence; and that even a fraction of the time devoted to writing would suffice to utter all the words penned. In the case of certain motor-minded pupils, writing is the most economical way of inducing reliable memory. Here the time-killing process justifies itself.

Correction, too, is much more easily accomplished orally, and is likely to produce a deeper psychological effect. If the pupil blunders in speech he can be halted on the instant, and the right nervous channel opened immediately, and cleared by a few repetitions. When writing, he goes on practicing his error, deepening the wrong nervous outlet, and the blue pencil of the teacher strikes too late. In case of dictation or written drill of any kind, a nearly immediate correction is furnished by the teacher's exhibiting the standard form, and directing the pupils as they detect and rectify all deviations from it. This also enables one to rid himself legitimately of many irksome bundles of exercises whose correction consumes his evening time and may even form a real barrier to his professional improvement.

Another good plan, especially with large classes, is to have pupils write rather frequent *brief* papers. These can be scanned rapidly, and without either marking or return-

ing them the most common errors and misconceptions can be corrected vividly in the classroom. This, if supplemented by judicious board work and by occasional test papers thoroughly corrected and thoroughly re-read by the pupil—it is often wise to take class time for this immediately upon the return of the paper—will usually prove sufficient to establish good written practice. All teachers who work together should unite on a simple system of proof readers' or rhetoricians' symbols to indicate errors in English, which should be used in the correction of papers in all branches. No matter how excellent the teaching of English, good usage is likely to be grossly and habitually violated unless teachers, in addition to pushing their specialties, unite in an effort to maintain the purity of the mother tongue.

Analysis and synthesis.—The objects to be analyzed may be either concrete or abstract. We analyze a flower by actually pulling it to pieces, or at least noting the number and relation of the parts as they stand. We analyze a sentence, a thought, a sermon, not by handling or viewing its parts, but by a purely mental process. It is true there may be some physical accompaniment to assist our imagery; we may utter the thought, or outline the sermon in writing.

Usually the chief reason for analyzing anything is to find how its parts go together, in order to build it up, synthesize it, and control it. So we analyze a square into unit squares and derive the rule for finding its area; in reading and writing we analyze words into sounds and letters, for the sake of rebuilding and controlling these words. Very similar and confusing objects can often be analyzed to advantage, as the similar parts of Latin verbs, or of such words as *af*fect and *ef*fect, or such numbers as 20,000 and 200,000.

Relation of parts is especially important where the same

elements, differently combined, produce different wholes, as *d-o-g* and *g-o-d* for young children, or *graph-o-phone* and *phon-o-graph* for older ones, or the numbers 12 and 21, or the place of the decimal point, or the order of words in such a sentence as *John struck James*, or the inversion of the right fraction in dividing.*

Lecture method, topical method, question method.—These are the three general ways by which teacher and pupils can communicate with each other. Their values ought to be fairly evident to one who is clear as to what he is trying to accomplish. Probably the most important principle to remember is that no one of them should be used incessantly.

The lecture or sermon method adapts itself well to information and appreciation lessons. Its use should depend largely on the age and earnestness of the class. So long as the mind of the pupil follows the thought of the instructor, all is well; the teacher should interrupt his talk with questions and discussions, and encourage his pupils to interrupt him, frequently enough to make sure that the mental contact points are sufficiently close for a current to pass. The lecture method is likely to entail great thoroughness of preparation on the part of the teacher, and laxity among the pupils. It should be supported by quizzes and written lessons or some form of practical accomplishment. There

* How far analysis should be carried in any case depends on the *purpose* in view, for theoretically it has no readily approachable limit. It would be silly, in an art lesson, to analyze the body into cells, and these in turn into molecules and atoms. But it would be equally foolish not to recognize that human beings are composed of head, trunk, and limbs. We may analyze a sentence into subject and predicate merely, or into words, or go further and analyze these words into sounds or letters, according to what we are trying to do, what we want our information *for*.

is special need of some kind of exercise that requires independent thought.

The topical method reverses matters; the pupil is required to lecture to the teacher. In other words, he is given a topic and is asked to tell what he can about it. Such a method, with its demands for organization of matter, for deft use of language, for sustained effort, is better suited to reviews than to new lessons. The advance lesson is likely to be scrappy and unorganized in the pupil's consciousness, not fully apperceived, laden with new terms not yet under control. To insist that such fragmentary material be worked up into smoothly flowing paragraphs means to drive the average pupil to memoriter work, unless he is given time to write his discussion. With reviews, even the brief daily reviews that introduce most lessons, the case is different; the matter ought to have undergone some assimilation, and a pupil should be able to recite freely in topics, up to the limit of his linguistic ability.

The question method will be discussed thoroughly in the next chapter.

Reviews and tests.—In the outside world we find that reviews and tests are undertaken for very practical purposes. The business man frequently reviews during his evening leisure the events of each day, but most of his information is "on file" rather than "on tap." The physician carries about with him sufficient knowledge to meet the demands of *ordinary* practice, but studies special cases and "reads up" the disease which threatens an epidemic. In each case there is a practical demand to be met, and knowledge or skill is revived to meet it.

The difficulty in school is that there are not enough *practical* demands that are felt by the child to be such. His

little ordeals are artificial, teacher-made troubles. If only there were something he really wanted to accomplish, the review or test could be made to stand between him and its accomplishment. If his highest ideal is to "pass," it may goad him on to large scholastic inflation at certain times of year. But the true review or test is different; it is the next *necessary step to solid attainment*, an accumulation of force in order to attack a new problem.

It is unnecessary, then, to cover every detail of the subject reviewed. We should adopt the method of history, scan the past to find what it can yield of value to the future. The same truth applies to our tests. They should not be mere random displays of the pupil's interior furnishings, but a run of the engine to find if it is ready to take the road, with an inspection to see that all the necessary tools are in place.

It is most important to review every day, briefly, the lesson of the preceding day. Our series of daily lessons should overlap like steps, each resting on the one below it. Teachers have to learn, often by bitter disappointment on examination day, that so far as concerns the practical survival of facts in the minds of pupils, the law of frequency is the law of life.

It helps us much in shaping our reviews and tests, if we are clear as to whether we should require from the pupil information, thought, appreciation, or skill. Skill is easily tested. There is a definite act to be performed; let the pupil prove himself by performing it. Only Ulysses can string Ulysses' bow.

In testing for *information*, it is better not to require any particular bits of it, any more than one would require a man to have among his small change a coin of a certain denomination and date. Let him show what he has, and see if it

makes a respectable display. Give the pupil good, sizable topics and let him discuss them, showing how many facts he has and how well he can marshal them. Of course some pieces of information are important because they are like keys, a means of controlling larger bulks. Such, for example, is the knowledge of where to place the decimal point. Such items must be well drilled in, and may then be demanded of all.

It is more difficult to test for *thought*. Information is supposed to be kept in stock to some extent, but real thought is a kind of original creation which cannot be forced,—witness the reward awaiting him who can produce a single new thought in art, literature, or mechanics. Perhaps we can wisely subdivide thinking into the *imitative* and the *original*. Given the number of pounds and the price per pound, a pupil should be able to "think out" the cost of a bag of sugar, if he has had practice in such work. But no problem which requires the discovery of a thoroughly new mental association, or the recognition of an old one in an utterly strange form, should be given in the course of the ordinary examination. Thinking is like mining. All you can do is to delve away, following the best lead you have; but when you are to strike ore depends largely on the luck.

Appreciation cannot be gauged accurately by ordinary schoolroom tests. This is unfortunate, for appreciation stands close to conduct and to life. It is trying to us teachers to know that our most precious product is too complex for ready measurement.

Examinations.—The traditional final examination, a test which, *independently of all class records*, determined the status of the candidate, is gone, we hope, forever. But only the sentiment of an extremist would sacrifice all examina-

tions because some have been abused. Examinations given by principal, superintendent, supervisor, state board, or some other inspecting agency may all be made to serve a high purpose and work for real efficiency. In spite of all the ancient objections, the right kind of pupil does not wish to escape the right kind of examination, given by the right kind of examiner.

The examiner should keep ever in mind the purpose of his examination, the scope he can legitimately cover, the complexity permissible in the time at the disposal of the candidate, and the aims to which the instructor has devoted his efforts. He should be a man of judicial temperament, one who will not be influenced—to take Binet's example—by the sourness of his stomach, or by his inward desire to see certain candidates or classes succeed or fail.

FOR FURTHER STUDY

1. Explain in psychological terms the difference between learning an act of skill and committing to memory the rule for performing the act.

2. Which should you value most highly, information concerning the technique of music, critical appreciation of others' music, or the ability to produce music yourself? Why? Should your view determine what you emphasize in teaching your pupils?

3. Analyze the following acts of skill into their simplest component acts: writing, reading, making a speech, lacing shoes, sawing off a board.

4. Resolved that it is more educative, that is, mentally beneficial, to be an amateur in many different sports than to be expert in one. Debate this.

5. Invent some ways of varying the drill on the most important dates in history; the chief cities in geography.

6. State some ways of isolating for special drill the most difficult combinations of the multiplication table; the hardest words in the reading or spelling lesson; the most common grammatical blunders made by your pupils.

7. Describe some experience that developed in you a degree of appreciation for a certain fact, or object, or law, or moral truth.

8. How would a boy "review" baseball if he expected to play an important game? How, if he expected to serve as umpire?

9. Wishing to employ a house servant or chauffeur, you give each applicant a written examination only. Comment on this.

10. Show how current events can be used in the appreciation lesson.

REFERENCES

Charters, W. W., *Methods of Teaching*, Chs. VIII, XXI, XXIII.

Gordy, J. P., *A Broader Elementary Education*, Ch. XVIII.

Hamilton, Samuel, *The Recitation*.

Landon, Joseph, *Principles and Practice of Teaching*, etc., Chs. III, V; and Parts III, IV, and V, of Ch. VI.

Scott, Colin A., *Social Education*, Ch. VIII.

Spencer, Herbert, *Education*. (See especially Chapter I, "What Knowledge is of Most Worth.")

Strayer, George Drayton, *Brief Course in the Teaching Process*, Chs. IV, V, VI, VII, IX, X.

White, Emerson E., *Examinations and Promotions in Graded Schools*. (U. S. Bureau of Education.)

CHAPTER XVI

QUESTIONING

"In a well-conducted class, we have actors only and no audience ['public']; each should play his part of greater or less importance, according to the piece and to his own ability. Or better still, if I may be permitted a second comparison, a class should be like an orchestra; but in an orchestra, there are none but players. No one plays from beginning to end of the selection; but there is no one who does not play, even if only for an instant, be it only to strike a single note at the right time, a blow on the tam-tam or on the big drum; all come into play, giving strict attention to the moment of striking in and to the performance of their parts. The solos are reserved for the better musicians, and the leader of the orchestra (yourself, teacher) directs the performers, ever turning, now to one, now to another, indicating by the stroke of his baton when the time is come to strike up; making look and gesture significant, not using his own instrument except when he perceives the performers losing spirit and wishes to encourage the orchestra.

"So in the class, it is needless that any should be inert or dead, as too often happens; life should run from seat to seat, stirring up the sleepy, inciting the dull, stimulating the indifferent, drawing all this little world into the same current. The energy the master employs in creating and sustaining this movement will be much better employed than that which he would use up in the wasteful effort of doing all the talking himself."

VESSIOT. (Translated from the French.)

EXERCISES.—How do you feel when a question is put to you? What is a question, psychologically considered? What relation does it bear to scientific procedure?

Make a list of questions such as you would use in teaching a third grade, "The Meaning of the Fourth of July."

Make a similar list of questions to be used for the same purpose in an eighth grade class.

Importance of questioning.—"What is most important in good teaching?" was asked of an old teacher. "Good questioning." "And what next?" "Good questioning." "And what third?" "Good questioning,—and so on to the end." This story, given by a French author, is reënforced by the aphorism of another French educator who says, *Savoir interroger, c'est savoir enseigner!* (To know how to question is to know how to teach.)

Our environment is one perpetual question. Wonder is the beginning of wisdom. We have seen that the first step in scientific method is "getting a definite question to answer." The teacher must furnish such questions.

Purpose of questions.—The question stimulates. To ask, "What causes dew?" rouses the pupil much more than to say to him, "Dew is caused by the contact of moist air with a body colder than itself." By questions we test the learner, perhaps make him feel that his mind is being thrown open to the public gaze; we find where his education leaves off, where we must begin to develop it; and we use the question constantly as a spur to such development.* It is wise, sometimes, to throw out a wonder question at the opening of a lesson, even one so difficult as to defeat the whole class temporarily, but which can be stormed and taken, in the course of a campaign of questions.

Further, question and answer serve to place teacher and pupil on a common level and maintain what may be called mental contact. Stiffness and formality are removed, and the lesson becomes conversational, *natural*. He is a skillful

* See the exercise at the close of the chapter.

teacher who can induce his pupils to question him and question each other intelligently.

Finally, questioning is an excellent means of maintaining order and centering attention on the particular point under discussion. Let the class learn that the shepherd has a crook in the form of a question mark, with which he captures the wandering sheep, and there will be little wandering.

Attitude of the teacher.—Questioning is more likely than are most other exercises to cause friction, irritation, perhaps resentment. The teacher should maintain toward the class a well-balanced attitude of dignified sympathy, kindliness, coöperation, firmness, restrained enthusiasm. She is not there to quiz her class into an appearance of knowledge which they do not possess, to pull them through in spite of themselves; nor to prove that their highest wisdom does not exceed the level of her lowest folly, to humiliate them in spite of themselves; but to meet them cordially on their own level and question them up to hers.

Kinds of questions.—When we ask a question we should know just what kind of challenge we are putting to the pupil, whether we require that he perceive, remember, imagine, think, show his appreciation, or demonstrate his skill. Probably the simplest way to keep this in mind is to classify questions as we do lessons: "When did Columbus discover America?" calls for *information;* "If the earth fell, where would it go?" requires *thought;* "Who is the greatest American?" opens an opportunity for *appreciation;* "How many words a minute can you write?" is a test of *skill.*

Qualities of good questions.—Questions must be *clear.* We but waste our breath if we fail to make the pupil understand what is wanted. Usually our questions will be brief and expressed in simple words. Always they will be adapted

to the age and development of the pupil. "What gregarious animals have their habitat in rural regions?" would hardly be understood by a fifth-grade child. "What animals are found in flocks or herds in the country?" would be better; but if the pupil has never been to the country, he may still be unable to answer.

The good question permits but one answer. Putting such a question is like holding up one half of a solid, such as the cone or the sphere, and asking the pupil to produce the other half; or like pointing to some niche of a half-completed picture puzzle and asking for the piece that will fit it. This eliminates vague and general questions. As a rule, do not ask: "Who was Cæsar?" or, "What have you to say of this poem of Longfellow's?" "On what river is Harrisburg?" is much better than "Where is Harrisburg?" if it is the fact of location on a river that is to be emphasized. But questions that are faulty in this respect when standing alone may be clear in a context of related questions.*

A series of questions should be so linked together, concatenated, as to urge the pupil toward a conclusion or climax. It is absolutely necessary that the teacher know the point she is steering for. In teaching Tennyson's *Crossing the Bar*, for example, it is ruinous to the splendid sentiment of the poem to drag in all the details of harbor construction. In teaching Cæsar's *Commentaries* one should not question about the whole military organization of Rome unless that is one of the avowed objects of the study. We should turn on only so many side lights as will show up our star subject in clear relief. We cannot too often remind ourselves that

* Emphasis, too, often shows which possible answer is required. "Did Christopher Columbus discover the maritime route to the Indies?" Such a question may refer primarily to Columbus, to the Indies, or to the discovery; emphasis determines which.

the high road to success lies in a clear discernment of the purpose to be achieved and an everlasting push toward its attainment.

Questions to be avoided.—Probably the most common and worst fault of all is that of *rambling*, merely filling in the time with questions of some sort, instead of pushing on to a definite conclusion.

Questions that suggest the answer are useless. Such are "What do you call a man who robs another?" "Did Cæsar cross the Rubicon?" But questions that imply a false answer are frequently valuable to test the suggestibility of the pupil; as, "Why did the North favor slavery?"

Questions that open but two alternatives, one type of these being the yes-or-no questions, are usually condemnable. If a coin is tossed a thousand times it will turn about five hundred heads and as many tails. If asked to foretell the result of each fall, we could give the same answer every time, without thought, and be certain of making fifty per cent on the test, in the long run. A pupil who knows nothing whatever about a subject can answer the ordinary yes-or-no questions without thought and be right half the time. It is very difficult, however, to avoid these questions altogether; and if the answers are followed up and subjected to further testing, all is well.

The common sense of every teacher will lead her to beware of a fixed set of questions, a catechism consisting, perhaps, of difficult definitions and other statements too profound, for the most part, for the young responders to understand. Any teacher who thus deceives herself and her casual visitors should have a superintendent who will prick the bubble by asking for a practical application of the truths expressed.

We should never, under ordinary circumstances, attempt to question pupils into thinking out *conventional* knowledge, such as the name of a river. If such facts are unknown when the need for them arises, they must simply be supplied. We can question out thought, but not information.

Calling on pupils.—When a question requiring thought is given out, there should be a pause to afford time for reflection, after which should follow the name of the pupil who is to answer. If the name of the pupil precedes the question, all the others can safely cease their search for the answer. Hand raising may be permitted, but any bustle or outcry of answers should be subdued at once. Teachers who have been falsely taught that they must work constantly at top speed and lift the safety valve with enthusiasm are likely to call forth such disorder, through imitation of their rapid movements and high-keyed voices. But if one is able to stand or sit still and yet put vigor into his work, he will easily subdue the too high waves of excitement.

It is of course unwise, as a rule, to call on pupils in any fixed order; and for most teachers it is worse than useless to shuffle cards bearing the names of the pupils, or use any such device to determine who shall receive the next question. To revert to the figure of the class as an orchestra, each question will often suggest the pupil who can most appropriately supply the answer, and who should "strike up" at this point. It is not a bad plan to make a considerable proportion of the questions simple, and distribute them among the weaker members of the class, keeping the better brains as reserves for emergencies. *Whoever reaches the duller pupils teaches all the pupils.*

Excepting when we wish to emphasize some statement by the force of united repetition, we should avoid concert

recitations. Each learner should as a rule be thrown on his own responsibility. But it is an excellent practice to give out unusually difficult questions to the class as a whole and let them combine their wits in its solution, keeping up a searching fire of minor questions to separate false answers from true.

Answers.—It ought to be unnecessary to say that an answer should be conceived by the pupil who gives it. Answers must be accurate, expressed in good English, complete, but not too inclusive or rambling. Completeness does not imply that yes or no or other abbreviated answers may not be used. They should be used habitually, as all sensible people in ordinary intercourse use them, except, possibly, when young pupils are learning the language. But monosyllabic grunts, or poor English, choppy and infirm, or muttering in low tones should not fail of correction. The attitude and behavior of the pupil while answering should be just that of all cultivated people in public places, neither slouchy, nor stiff with the starch of formality.

No pupil should be interrupted while answering, except to correct a fault so grave that the interruption is desirable to emphasize the correction.

Very conscientious or traditionally minded teachers sometimes feel that each recitation of every pupil should receive a mark. Such a process may be necessary occasionally; but speaking generally the time so occupied is wasted.

FOR FURTHER STUDY

Following is a most excellent example of questioning, quoted from Fitch, who took it from Plato. The student should read it carefully, criticizing the questions both favor-

ably and adversely, noting in particular the exposition of error, and the compulsion to think,—*to think the truth.*

There was one of the disciples of Socrates, named Meno, who had been thus probed and interrogated until he felt a somewhat uncomfortable conviction that he was not so wise as he had thought, and who complained to the philosopher of what he called the merely negative character of his instruction.

"Why, Socrates," said he, "you remind me of that broad sea fish called the torpedo, which produces a numbness in the person who approaches and touches it. For, in truth, I seem benumbed both in mind and mouth, and know not what to reply to you, and yet I have often spoken on this subject with great fluency and success."

In reply Socrates says little, but calls to him Meno's attendant, a young slave boy, and begins to question him.

"My boy, do you know what figure this is?" (drawing a square upon the ground with a stick).

"O yes. It is a square."

"What do you notice about these lines?" (tracing them).

"That all four are equal."

"Could there be another space like this, only larger or less?"

"Certainly."

"Suppose this line (pointing to one of the sides) is two feet long, how many feet will there be in the whole?"

"Twice two."

"How many is that?"

"Four."

"Will it be possible to have another space twice this size?"

"Yes."

"How many square feet will it contain?"

"Eight."

"Then how long will the sides of such a space be?"

"It is plain, Socrates, that it will be twice the length."

"You see, Meno, that I teach this boy nothing, I only question him. And he thinks he knows the right answer to my question; but does he know?"

"Certainly not," replied Meno.

"Let us return to him again."

"My boy, you say that from a line of four feet long there will be produced a space of eight square feet; is it so?"

"Yes, Socrates, I think so."

"Let us try, then." (He prolongs the line to double the length.)

"Is this the line you mean?"

"Certainly." (He completes the square.)

"How large is become the whole space?"

"Why it is four times as large."

"How many feet does it contain?"

"Sixteen."

"How many ought double the square to contain?"

"Eight."

After a few more questions the lad suggests that the line should be three feet long since four feet are too much.

"If, then, it be three feet, we will add the half of the first line to it, shall we?"

"Yes." (He draws the whole square on a line of three feet.)

"Now, if the first square we drew contained twice two feet, and the second four times four feet, how many does the last contain?"

"Three times three, Socrates."

"And how many ought it to contain?"

"Only eight, or one less than nine."

"Well, now, since this is not the line on which to draw the square we wanted, tell me how long it should be."

"Indeed, sir, I don't know."

"Now observe, Meno, what has happened to this boy; you see he did not know at first, neither does he yet know. But he then answered boldly, because he fancied he knew; now he is quite at a loss, and though he is still as ignorant as before, he does not think he knows."

Meno replies, "What you say is quite true, Socrates."

"Is he not, then, in a better state now in respect to the matter of which he was ignorant?"

"Most assuredly he is."

"In causing him to be thus at a loss, and benumbing him like a torpedo, have we done him any harm?"

"None, certainly."

"We have at least made some progress toward finding out his true

position. For now, knowing nothing, he is more likely to inquire and search for himself."

REFERENCES

Fitch, J. G., *The Art of Questioning.*

Landon, Joseph, *The Art of Questioning.*

Strayer, George Drayton, *Brief Course in the Teaching Process*, Ch. XI.

Parker, Samuel Chester, *Methods of Teaching in High Schools*, Ch. XX.

CHAPTER XVII

PLANNING THE LESSON

"'Notes' should be to the lesson what the artist's careful design, or sketch in color, is to the finished picture—a sketch containing all the essentials, but not burdened with the many small details which will come out in the work itself." *

EXERCISE.—Recall some lesson which has impressed you deeply, and try to work out an outline of it, such as you think your teacher must have followed when teaching it to you.

When you have read this chapter, criticize your plan. Then take or send it to the teacher in question, for comment. Find out the usual practice of this teacher with regard to lesson plans.

Purpose and value of the lesson plan.—Teachers (like most other human beings) are prone to quiddle, to flit from one petty point to another and arrive nowhere in particular. The lesson plan compels us to think where we are going, and to lay down a direct route to the goal.

Planning a lesson is much like planning a meal, or like the physician's writing a prescription for his patient; we must keep topmost in our minds those for whom we are planning. Plans must vary because children vary. We cannot plan our lessons intelligently until we know how nature has planned the children. Better to write up the "plan" of the one child whom you find it difficult to bring within the

* Joseph Landon, *Principles and Practice of Teaching.*

circle of your influence, to try to see his little life from his viewpoint, to find what forces you can bring to bear on him to reform and sweeten his behavior, than to work out a thousand "logical" arrangements of dead subject matter for "the child." The cook must know well the tastes of the family she serves, and not have her mind centered too strongly on the many mechanical devices of the kitchen.*

What the lesson plan should include.—The essentials of a good lesson plan are listed below.

1. *Purpose.* Make clear to yourself what you are actually trying to do in giving the lesson. Further, consider the *pupil's* purpose, present a problem that will appeal to him, an aim that he will care to achieve, a motive that will move him.

2. *Subject matter.* Hold fast to the fundamental facts and omit all others. Arrange the essentials as clearly and simply as possible.

3. *Method.* Outline what you propose to do, step after step.

4. *Special devices.* Provide apt illustrations and well-framed questions to apply to knotty problems, and indicate the use of outlines or summaries at strategic points. Make note of the books, models, apparatus, etc., to be used.†

The brief plan.—How much of this should be written out in actual practice, each may determine for himself. Some

* In many practice schools the mechanics of lesson planning is pushed to an extreme. One is tempted to assume the attitude of the stolid traveler who remarked as he critically surveyed Niagara Falls, "Very fine, but a trifle overdone!"

† When planning a lesson, it is well to array your class before you in imagination, as the successful orator so often composes for an imaginary audience. If there is anything difficult to be done, such as the working of apparatus, practice it in private first.

can undoubtedly teach well without writing anything. But if one expects to repeat, or even review the lesson, it is wise to make note of such things as cannot readily be recovered, a happy illustration, the location of material, an unusually successful method, and the like.

The following outline furnishes a suggestion of what may appear in a nature-study lesson. But even this could be much shortened. The outline shows the skeleton of an Information Lesson.

A STUDY OF COAL

How It Got into the Ground, and How We Get It Out

Purpose. Information for the sake of appreciation and thought later on.

Materials. Encyclopedia, post cards, and projector. Specimens of peat, coal, fossils, etc., from school museum.

Assignment. Ask pupils to talk with parents, look at coal, read whatever they can find, and bring pictures if possible.

1. Question children on what they have found. Has anyone been in a coal mine? Etc.

2. Why is coal called "buried sunshine"? Whence the heat and light we get from this black "stone"? Is it stone?

3. Tell of ancient forests of great ferns and trees, fallen and covered by mud. Like swamp. (Refer to encyclopedia.) Peat bogs. Specimen of peat. Its use as fuel.

4. Great pressure for centuries. (Blackboard drawing to show strata.) Sample of soft coal. Locomotive smoke. Discussion.

5. Final change: hard, or *stone* coal. What are stones made of? Coal made of what? "Dusky diamonds." Coal, diamond, and lead in pencil all made of carbon.

6. Pupils explain fossils found in coal. Examine specimens.

7. Story of mines and mining. Location of the great coal fields. Follow order of pictures projected. Show children's pictures.

8. Prepare for next lesson: appreciation. Uses of coal. Suppose coal all gone; what then?

The detailed plan.—Occasionally, to achieve some special purpose, it is well to place a *detailed* lesson plan on paper. Such a procedure is wise for self-criticism, and still more valuable when the plan is to be presented to another in order to instruct him, or to secure his criticism. But those who criticize such plans should remember that there is wide room for individual variation. The conscientious young teacher, like the bashful boy in the parlor, often feels that there is but one correct line of conduct, that he is very likely to miss it, and that in every other direction lies reproach. His dominant emotions are self-consciousness and fear, with their accompanying inhibitions. He ought rather to feel like the boy on the ice pond, that there are many courses open,—only keep clear of the danger points. Epimetheus should teach us, as well as Prometheus; if the candidate is encouraged to retrospect, to reflect upon the actual result of his lesson and report upon it, perhaps in writing, his imagination will work at a livelier pace over his next effort.

Following is an example of a detailed plan which also illustrates the traditional practice of using one column for "matter" and a parallel one for "method." Note the frequent use of the blackboard. This is an example of the Lesson for Thought.

HOW CAUSE A BALL TO CURVE?

Teacher's object. To show the effect of resistance of air on a ball that spins as it moves along.

Pupils' object. To learn the science of curving a baseball or tennis ball.

Materials. Hollow rubber ball; pan of water. Also, if possible, baseball, tennis ball, and racquet; rifle bullets, spherical and elongated; rifle.

Matter	*Method*
1. How many have observed balls curving? What advantage has a player who can control curves? In baseball? In tennis?	Arouse interest. Story of professor who declared curves impossible. Pitcher throws one. Professor: "It *is* impossible—but you have done it!"
2. You are on the outer edge of the sidewalk and meet a crowd. Pressure on one side, no resistance on the other. Result? Suppose equal crowd each side of you; then what?	Quick blackboard drawings, using symbols for people.
3. If you turned clockwise as you moved through crowd, what effect?	See that "clockwise" is understood. Drawing to show that while one shoulder is opposed to crowd, the other yields somewhat.
4. Similar, when ball moves through compact crowd of drops of water. One side bumps into drops as it rolls forward, while the other constantly yields.	Spin a floating ball into a pan of water. Observe its curving path. Pupils try it. Why is this? Diagram on board. Try ball spinning the other way, and with no spin.
5. Air also is a compact crowd of tiny particles. One side of spinning ball meets resistance while the other gives way.	Further and varied diagrams.
6. Statement of law of curving as related to spin. "A ball moving through the air curves to the side toward which its front is spinning."	Statement drawn from pupils and placed on board.
7. Pitcher starts spin by rolling ball off his fingers. Difficulty of throwing a "drop."	Have boys demonstrate. Diagram. Refer to mechanical pitcher once substituted for living one; loss of interest.
8. Tennis ball is curved by sliding racquet as it strikes ball. "Slide your racquet 'just the other way' from where you want the ball to go."	Demonstration. Draw out rule for sliding stroke. Discuss "cuts," sideward and downward curves.
9. Application of principle.	What part of diagrams would

Matter	*Method*
Could we curve balls if there were no air?	be removed? Discussion. Explain the professor's error.
Spherical rifle balls shoot less accurately than the elongated type. Why?	Show or draw bullets.
Grooves in the rifle barrel cause the bullet to spin round its long axis. Does such spin cause the bullet to curve? Explain.	Show rifle or make drawing. Diagram to show why elongated bullet does not curve. Discussion.

The lesson for appreciation.—A plan has now been given for an information lesson, and one for a lesson for thought. Following are brief, private-property notes of a lesson designed to arouse appreciation of a moral principle.

WHY TELL THE TRUTH?

1. Get children's reasons: to please parent or teacher, etc.

2. Parents want it to please fancy, as roses are planted in the yard? Wrong because good books forbid, or do good books forbid because *wrong?*

Best for us to tell truth. Why? Get children's reasons.

3. Personal, egoistic reason for truthtelling. Tell (or have told) the story of the boy who cried "Wolf!" Experience of some who have lied (including my own). Get children's comments and summarize.

4. Social, altruistic reason. Fable of clocks that told different time throughout city—all business disordered. Liars like wicked clocks. Suppose everybody lied—no special privilege permitted.

Worst punishment of liar: having no one to lie to. Ostracism. Robinson Crusoe. Value of kindred, friends, society, all trustworthy.

5. Summary.

Drilling for skill.—Two specimens of the drill lesson appear below. The first is taken from White,* who quotes

* Emerson E. White, *Art of Teaching*, pp. 82, 83. American Book Company, publishers. Used by permission.

from "a visitor to a primary school in one of our large cities," an account of a lesson actually given—an instructive example of how *not* to do it!

A FAULTY DRILL LESSON

The pupil at the head of the class rose and said: 7; 6 and 1 are 7; 1 and 6 are 7, and this was repeated by sixty pupils in turn, each rising. The drill proceeded:
HEAD PUPIL: 7; 5 and 2 are 7; 2 and 5 are 7—repeated in turn by all.
HEAD PUPIL: 7; 4 and 3 are 7; 3 and 4 are 7—repeated in turn by all.
HEAD PUPIL: 7; one 6 in 7 and 1 over—repeated in turn by all.
HEAD PUPIL: 7; one 5 in 7 and 2 over—repeated in turn by all.
HEAD PUPIL: 7; one 4 in 7 and 3 over—repeated in turn by all.
HEAD PUPIL: 7; two 3's in 7 and one over—repeated in turn by all.
HEAD PUPIL: 7; three 2's in 7 and 1 over—repeated in turn by all.
HEAD PUPIL: 7; seven 1's in 7—repeated in turn by all.
HEAD PUPIL: 7 is 7 times 1—repeated in turn by all.
HEAD PUPIL: 7 is 3 times 2 plus 1—repeated in turn by all.
HEAD PUPIL: 7 is twice 3 plus 1—repeated in turn by all.
HEAD PUPIL: 7 is once 4 plus 3—repeated in turn by all.
HEAD PUPIL: 7 is once 5 plus 2—repeated in turn by all.
HEAD PUPIL: 7 is once 6 plus 1—repeated in turn by all.
HEAD PUPIL: 7 is once 7—repeated in turn by all.
And the number seven was exhausted!

"It is evident," says Dr. White, "that the result of this exercise would have been about the same if all the pupils in the class, except the head one, had been parrots with the gift of imitating sounds! No pupil, except the one at the head, was obliged to see a number relation vocally expressed. The drill, if desirable, could have been effectively conducted in one third of the time, and every pupil obliged to see each number relation."

The second example is from Strayer.*

* George Strayer, *Brief Course in the Teaching Process.* Used by permission of The Macmillan Company, publishers.

The work indicated here can be done in one period. The plan is given as an illustration of the principles involved in good drill work. It is especially necessary, in planning for lessons of this type, to be ready to vary the exercises in order to maintain the interest and attention of the class. Repetition with attention is what counts for habit formation. The children have been playing a game in which the score secured by throwing a bean bag in squares, numbered from one to ten, has been multiplied by two and later by three. The class has been divided into sides, and the competition has been keen. They want to make larger scores, and, therefore, have a compelling motive for studying the next table.

A PLAN FOR A DRILL LESSON

Teacher's aim: To teach multiplication by four. If we are to make larger scores, what table must we learn next? How many think they can learn half of the table of fours to-day? If you learn it, we will play our game for ten minutes.

Pupil's aim: To learn the multiplication table of fours.

Subject Matter	Method
$4 \times 4 = 16$ $4 \times 2 = 8$ $4 \times 6 = 24$ $4 \times 3 = 12$ $4 \times 5 = 20$	Teacher writes the table on the blackboard, as indicated under subject matter. How many are sure they know the first two? Look at me and answer as I ask the results. Don't answer unless you are sure. Now let us take the first three. Proceed as before. I'll erase the first three. Look at them carefully. Now write them on your tablets. $4 \times 4 =$ $4 \times 2 =$ $4 \times 6 =$ Do not write the answers unless you are sure you are right. Let four or five children read their answers.

Subject Matter	Method
	Margaret may ask for answers. She drills on the first three combinations. The other two are easy to remember,—four times three we know; it is the same as three times four, and four times five are twenty we can all remember. Look carefully; I am going to erase them. Drill by teacher on last two combinations. All combinations put on board again and read and written by children. Robert tries to discover whether there is any girl who has forgotten any part of the table. Katherine tries to catch the boys. All write at the dictation of the teacher, supplying the products. The game is then played. When anyone makes a mistake in recording his score on the blackboard, his side is penalized the amount of his mistake.

Possibly all the plans the experienced teacher needs for the lesson outlined above are a few notes concerning the variations to be introduced from time to time in the drill. She must plan, however, to put zest into the lessons by means of the variety which she introduces, and she must, if she is to get the best work, provide some motive which will make the drill work seem worth while to the children.

Plans for reviewing history.—The following suggestions are offered for the review of a chapter or epoch in history with an upper grammar or high-school class.

1. Let each write up one or more of the leading events as if he were reporting for a daily paper. Teacher may make assignments, "sending" reporters to various localities to collect news. Class discussion.

2. Write an article on the chapter, taking as an ideal a

magazine article. State and defend your views on the larger questions involved. Class discussion.

3. Find answers to a list of questions prepared by the teacher.

4. Write "extracts" from the diary of your hero or heroine of this time, in such a way as to connect the chief events and show his (or her) view of them. Class criticism.

5. Let each personify a character, telling of his life and deeds, but keep his name unknown to the class as long as possible. Class may criticize, and report on their recognition of the character.

6. Let each prepare five (or more) questions,—none dealing with petty details, placing one only on a slip. Contest to win slips by giving answers satisfactory to teacher.

7. Give complete history of assigned topics of this chapter, as slavery or a political party, tracing back through all previous chapters covered.

8. Show relation of topics of this chapter to those now discussed in daily papers.

9. Write (if matter is pretty well mastered), "a piece of possible history," dealing with critical points, and showing how differently all *might* have turned out if—.

SAMPLE EXAMINATION QUESTIONS. NORTH AMERICA. GRADE EIGHT

1. (a) State approximately the parallels and meridians that bound North America. (b) What political divisions are crossed by the Tropic of Cancer?

2. Draw from memory an outline map of this continent, and name the chief indentations.

3. Name the principal drainage areas and the largest river of each.

4. Contrast the climate and products of Alaska and Mexico.

5. Name important minerals and the regions where each is found.

6. What are the chief races found here? Tell why you think these races are distributed as they are, and not otherwise.

7. Which would be better, to push the wheat belt of Canada farther north by breeding more resistive wheat, or to discover a new gold field like the Klondike? Why?

8. State some advantages resulting from the opening of the Panama Canal.

9. Where are the great agricultural regions? Manufacturing regions?

10. Give the chief Atlantic and the chief Pacific seaports, and mention important products that pass through each.

FAULTY EXAMINATION QUESTIONS. NORTH AMERICA. GRADE EIGHT

1. Name all the capes and bays along the Atlantic coast.
2. How far does the Rio Grande bound the United States?
3. What is Mexico noted for?
4. What and where is the highest peak in North America?
5. Give the population of Halifax; Havana; St. Louis; Sitka.

FOR FURTHER STUDY

1. Criticize the "faulty examination questions" given above.

2. State the chief faults of the drill lesson quoted from White (p. 196). Tell how you would drill on the number seven.

3. You are teaching in New York: write a lesson plan on some topic connected with the city, as its geography or history. Rewrite the plan from the standpoint of a teacher in Seattle, Washington.

4. Write the plan of a lesson on "Color" (any aspect of the general subject), to be taught to feeble-minded children. Rewrite the plan for normal pupils.

Note.—State how much knowledge you assume these classes to have. Remember that the first thing to do with most feeble-minded children is to wake up their *senses* and secure some kind of *motor* response.

5. When a lesson has been taught, how can you tell whether or not it was successful?

6. Would it be wise to have pupils (say in the seventh grade) write out a "Plan for Studying"? Give reasons.

7. Write at least one plan for each kind of lesson, information, thought, etc.

8. As the carpenter works from a blue print, so must the teacher work from a plan. Criticize this argument.

9. How long should a cook put on paper a detailed plan of each meal she prepared? Compare with teaching.

REFERENCES

Charters, W. W., *Methods of Teaching*, Ch. XXV.

Landon, Joseph, *Principles and Practice of Teaching*, Ch. IV.

Strayer, George Drayton, *Brief Course in the Teaching Process*, Ch. XVI.

CHAPTER XVIII

TEACHING SELF-EDUCATION

"Teaching pupils how to study—or better, how to educate themselves—is obviously as important as teaching them to know certain facts and to do certain things. The willingness and ability to study efficiently—to educate oneself well—involves (1) having purposes or aims, (2) putting questions to oneself, (3) bringing to bear upon any problem whatever relevant facts one knows, (4) organizing these facts according to their bearings upon the problem, (5) ~~searching~~ for more in the writings of men competent to inform ~~one about the~~ problem in question, (6) judging the merits of the suggestions thus received, (7) observing and experimenting in first-hand contact with facts, (8) economizing time and energy in the triple task of forming habits, acquiring skill, and memorizing what is permanently needed, (9) using the knowledge or skill or interest when it is gained, and cherishing ideals of open-mindedness, fairness, accuracy, thoroughness, and caution." *

Exercise.—Write out your present ideas on the topic, "How to Assign a Lesson."

The greatest thing you will ever teach your pupils is that they can get along without you! The test of the swimming pool is the test everywhere; he is the best master who can teach his pupils to strike out alone. He was a wise Frenchman who insisted that his object was to make himself as *useless as possible* to his pupils.

Books and education.—To the ordinary observer education is a kind of book business. So often do we resort to

* Edward L. Thorndike, *Education*. Used by permission of the author.

books for wisdom that we are in danger of mistaking the book for the wisdom. "It is written" has come to mean, "It is true"; and some are heedless enough to attach that meaning to the phrase, "It is printed."

But we must not be slaves to the book. Education existed long before books, and even yet it should always begin without them. It is enlightening for every teacher to ponder what she would do if fire or flood should destroy all books, or at least all her pupils' books,—how she would contrive to continue their education by some other means than the assignment and recitation of lessons.

The book as a substitute for the teacher.—When we explore a new and somewhat dangerous country, a guide is valuable and oftentimes indispensable. But independence grows of experience, and a guide book at length takes the place of the living leader. Having acquired skill in understanding the book, we can travel safely alone.

Education is the exploring of a country that is new to the young adventurer. His guide, on whom he is at first utterly dependent, is the teacher. But the teacher's daily contact with each child is very limited; to extend her presence, to multiply her influence, to afford aid that may be drawn upon in any time of need, she provides a guide book in the form of a textbook. It would be altogether desirable if every able teacher could prepare her own textbook, a personal "first aid" that would tell what to do till the teacher comes. As it is, she is apt to bow meekly before the traditional authority of whatever appears in print. It is all too easy for her to believe that the education she is trying to give the children is shut up in the book, and must be wormed out of it in some way. But the art is in the *artist*, not in his brushes and pigments.

The first studying should be done with the teacher.— The guide book should be consulted in the presence of the guide, until it can be correctly interpreted in his absence. When the first grade child learns to read, he gets along most happily for some time without the book. When at length the print is placed in his hands, he and the teacher should work together over the lessons, until he shows that he is ready to go on alone.

Nor should this study recitation, as it has been called, be confined to primary grades. The student who is learning a foreign language should learn the pronunciation of its declensions and conjugations, in large measure, from the lips of his teacher; and instead of being turned loose to puzzle out his own translations and incidentally fall into bad habits, he should first learn "the tricks of the trade" by following a master through all the mental operations required to make strange-looking words and sentences actually mean something in good English.

Frequently, before the learner can appreciate or understand the book, he must be put through a course of apperceptive development; * that is, he must have some actual first-hand experiences before he can read meaning into the words that refer to such experiences. The student who has received a stunning blow from the opening definitions and discussions of some old-fashioned text in physics, grammar, geometry, or psychology, will know exactly what is here referred to. The first duty of a teacher who is starting such a class is not to assign a book lesson, but to talk to and with his students in a cordial, informal way, until they understand, however crudely, the general situation and purpose;

* See, in Chapter VII, "Poverty of the pupil's mind," and in Chapter VIII, "Apperçeption in teaching."

to give experiments and other experience if need be,—and need there usually is,—and then to read and study with them some portion of the textbook, until he finds that they can master it, for the most part, alone.

The assignment of lessons.—Perhaps the most necessary point to keep in mind here is that the lesson must be adapted to the pupil at his stage of advancement. Of course the teacher cannot act intelligently, unless she knows both the lesson and the learner. Next, the length of the lesson must be determined carefully in its relation to the ability of the pupil, and the time he can reasonably be expected to devote to it. This is of especial importance in schools conducted on the departmental plan, for each teacher must recall constantly that several other teachers also are assigning lessons for her pupils. There is danger that each will attempt to magnify his office. A happy method of adjustment is the determination, in faculty meeting, of the amount of time each teacher may claim.

One of the most fatal methods of lesson assignment consists in determining, at the beginning of a term or a year, how many pages of text shall be completed in this period, and then dividing the number of pages by the number of recitations. Not only are pages of unequal value, but the whole process is likely to result in dawdling or forcing. The same danger threatens, when a number of differing classes are compelled to advance at the same pace. *Each class, provided it does faithful work, is the measure of what it can do.*

One of the best means of insuring the mastery of the lesson is to clear up its precise *purpose*. Frequently the pupil fails because he does not know just what is expected of him. The dominant purpose of the task can often be indicated by a question or a series of questions, or a brief

outline for the direction of study may be given, or significant passages in the text may be marked. In addition, all obscure language, or unusual difficulty of meaning should be made plain in advance. *The fundamental excellence of all good teaching is clearness.*

Teaching pupils to study.—The only one who knows thoroughly the *science* of studying is the expert psychologist. To attempt to teach his intricate science to children is folly. But we can practice the *art* of study with our pupils, thus heading off bad habits and setting up good ones. And the more the children mature, the more we can teach them of mental self-management.

The most general method of attack, one which it is safe to encourage in dealing with any ordinary lesson, consists of three stages, (1) getting a comprehensive first view, (2) working thoroughly through the minor steps that make up the body of the task, and (3) looking back over the lesson as a whole to make sure that all parts are correctly related.

(1) The pupil may well be encouraged to think of the lesson as a range of territory to be explored; it is well to see it as a whole, from some vantage point, first of all. If he is to read a chapter or a section, he should turn to the table of contents and see where and how this assignment stands with reference to other portions of the book,—what has led up to it, what follows. Next, he may read rapidly over the whole assignment, even if the meaning is not yet perfectly clear at some points. Having taken such an airship view, he will know where the new territory abuts on old, familiar ground, and so be less likely to get lost in details when he begins the actual work of exploration.

(2) The second part of the process consists in working

over the smaller units, making each topic, paragraph, and sentence deliver its meaning. If a real classic is being studied, it pays to work with dictionary and reference book at elbow. This searching out of bypaths, beating of bushes, and turning over of stones may continue as far as time and purpose warrant.

(3) Finally, when one has gained the hilltop of mastery, he should turn and make a careful review of the ground covered, fixing in mind irremovably the chief landmarks. A brief outline or analysis will help to accomplish this.

The habits we try to train into pupils will depend on the *kind of lesson.* The importance of pointing out the precise purpose of the lesson at the time of its assignment has been emphasized above. The pupil need not be very old, before he can understand whether he is to collect facts ("information"), or work out a problem ("thought"), or master some process ("skill"), or form an estimate of something ("appreciation").

Training for the information lesson demands that the pupil be taught (1) how to find and collect information, use reference books, source books, etc.; (2) how to organize the material collected; (3) how to commit it to memory most easily, or place it on file for future use. *

The art of thinking requires that pupils habitually (1) look for what is given to think *from;* (2) consider what is demanded, what they are to think their way *to;* (3) search for a way from the one to the other.†

The precepts most necessary in working for appreciation

* See Ch. VII, "Collecting Mental Material"; Ch. IX, "Remembering and Imagining"; and "The Lesson for Information," as treated in Ch. XIV.

† See Ch. X, "Thinking"; and "The Lesson for Thought," as treated in Ch. XIV.

and for skill have already been presented.* The pupil must catch the correct procedure, for the most part, by working with his teacher and imitating her practice.

It is evident from all this that we must regard our pupils as apprentices in the art of learning, and we must spend many a period in practical study with them, instead of merely hearing lessons. Such periods are not wasted; they are like the time the mechanic spends in sharpening his tools.

Conditions for successful study.—There are certain physical and mental conditions for study which every teacher aims to secure in her schoolroom, and which every learner, as soon as he is capable of independent work at home or in his study, should be exhorted to secure for himself. It is well, on entering either schoolroom or study, to let the words "heat, light, air," flit through one's mind habitually, and to proceed first of all to the regulation of these primitive necessities,—the first in accordance with a thermometer.

Mentally, one should be (1) fresh, (2) comfortable, (3) composed, (4) attentive. (1) The fagged-out student would often succeed better by loafing or dozing through half his study hour, in order to spend the remainder in quickened accomplishment. It pays the chopper to keep his ax sharp. (2) It is evident that one must be free from all distracting discomforts, such as may arise from too recent eating, or tight clothing, or improper furniture, or physical ailment. (3) We have learned that deep thinking and turbulent feeling tend to crowd each other out; it is well if one does not even feel *too* feverish an interest in the lesson. If fear, worry, or any other emotion is present, it must be calmly but decisively abandoned to death. (4) The best method

* See Chs. XI and XIII; also "The Lesson for Appreciation," and "The Lesson for Skill," as treated in Ch. XIV.

of insuring the desirable mental attitude is to proceed promptly, quietly, and steadfastly about the business in hand. The engine runs better as it warms up.

This last condition, that of attention, is the one for which all the others exist. *Concentration* is the student's word of magic; his mind should thrill with the subject before him, and with nothing else. He must learn to work concentratedly amidst distracting surroundings, as the typist or telegrapher works in a room where many other machines are going; as the business man reads his letter or carries on a personal conversation in a crowd, if necessary. Conditions should be made as favorable as possible, in order to economize nerve energy, but the pupil must learn to work and win, whatever the distractions about him. The surest guaranty of such learning is a heart set on victory. He who makes up his mind to "get there or die" is likely to live to get there.

Books other than the textbook.—From the time when the pupil has learned to read, he should be encouraged to make the acquaintance of books other than those forced upon him. This practice should begin with the juvenile lore borrowed from the little library of his grade or room, should expand into an acquaintance with the school library, spread to the library of his town, and finally embrace the largest and choicest collections of books to which he is fortunate enough to have access. Those schools are to be congratulated whose town library will coöperate with them, set apart books for their use, aid in guiding the student's reading, teach him the use of indexes, and in general make itself as educationally influential with the younger generation as with the older.

As the student at length finds his way into a vocation, he

should be put into touch with all the chief sources of information concerning his chosen field, including government departments, publishers, and the leading periodicals.

Student helps.—One's ability for practical accomplishment depends largely on taking advantage of labor-saving contrivances and mechanical aids. The average student keeps many notes on vagrant slips of paper, or buys a bound book for each subject, instead of procuring a single loose-leaf book which, with suitable markers, would serve for all classes and permit him to re-arrange and permanently file his notes as he pleased. Further, he often attempts to transcribe all details, or else lets the whole matter go by the board and records nothing. The medium method of catching *important* points only is best. In collecting notes for an essay, it is a good plan to use a small pad or loose-leaf book, placing a single note only on each leaflet. The leaves can then be quickly arranged according to the heads of the outline. The use of library cards in the preparation of bibliographies and for recording the names of books to be purchased later; of a simple and cheap alphabetical file for stowing clippings, catalogues and other matter liable to misplacement or loss; even such simple devices as clips and binders and program calendars, and the marking of one's books to insure quick reviews of important passages, will all make a difference in the practical efficiency of one who is learning to plan and execute his work independently.

FOR FURTHER STUDY

1. Should pupils be encouraged to criticize their text-books? Why? Should they be allowed to criticize their teachers? Their teachers' opinions?

2. Have you ever had lessons too long, too difficult, or too trifling? Describe your feelings in each case.

3. Do you know of any instances in which classes have been "rushed" to complete work in a set time? What were the results, both immediate and remote?

4. The best teachers are usually said by their pupils to be "good at explaining things." Why is this?

5. Have you thoughtfully adopted what you regard as the best plan of note taking?

6. Have you decided which periodicals will be best for you to subscribe for as teachers? How can you determine this?

7. List the advantages and disadvantages of trying to master a subject without a teacher.

8. Resolved: that the first study of any foreign language should be carried on with an interlinear translation. Debate this.

9. Have you a thermometer in your study? Do you keep a window or other efficient ventilator open? What candle power of light have you?

10. Did you progress most satisfactorily when your teacher confined the work almost wholly to a single book, or when you had no single book to rely on, but were referred to many sources of information? What practice do you advocate, for fairly mature pupils?

REFERENCES

Bagley, William Chandler, *Classroom Management*, Ch. XIII.

Earhart, Lida B., *Teaching Children to Study.*

Hinsdale, B. A., *The Art of Study.*

McMurry, F. M., *How to Study.*

Strayer, George Drayton, *Brief Course in the Teaching Process*, Ch. VIII.

CHAPTER XIX

PEDAGOGICAL MEASUREMENTS

"It is the custom to measure intellectual ability and achievement, as manifested in school studies, by marks on an arbitrary scale; for instance, from 0 to 100 or from 0 to 10. Suppose now that one boy in Latin is scored 60 and another 90. Does this mean, as it would in ordinary arithmetic, that the second boy has one and one half times as much ability or has done one and one half times as well? . . . The same difference in ability may, in fact, be denoted by the step from 60 to 90 by one teacher, by the step from 40 to 95 by another, by the step of from 75 to 92 by another, and even by still another by the step from 90 to 96. Obviously school marks are quite arbitrary, and their use at their face value as measures is entirely unjustifiable. A 90 boy may be four times or three times or six fifths as able as an 80 boy." *

Exercise.—How can we measure the ability of a sixth-grade boy in arithmetic? If we give him an examination, how many questions are necessary to constitute a fair test? What shall be the percentage value of each question? Would different teachers be likely to agree if they evaluated the answers independently? Would the average mark of a hundred teachers be more or less valuable than any single mark? Why? If a second boy made twice as high a mark, would it be certain that he knew twice as much about arithmetic?

Measurement as a means to progress.—Without measurement, it would be hard to build either barns or brains. In dealing with the objective, the environmental, we measure

* Edward L. Thorndike, *Mental and Social Measurements*. Used by permission of the author.

everything; in dealing with the subjective, the mental, it was long thought impossible to measure anything. But the whole psychological world has for years been agonizing itself to measure mind, and with some success. The time may even come when it will be possible to measure off a certain amount of education and pay for it by the piece!

We have seen (in Chapter II) that sciences are either exact or approximate. An exact science is always a science that does much measuring. Mathematics, physics, astronomy, and chemistry are good examples of this. Compass and ruler, the balance, the stopwatch, and other means of measuring are prominent in all that these sciences do. Can education become an exact science? It can if it can measure.

Whenever a parent wishes to know what he may expect from the schooling of his child; when we want to find out how much talent a pupil has, and for what; when we would like to know which of two methods is better, or how much faster pupils would learn if they could have good air to breathe instead of bad, then we wish that education could measure, and measure "to a T."

What must the teacher measure?—Many educational measurements fall outside the schoolroom, some of them to the superintendent. Such are the measurement of all the money the school district can put into its schools, the money and effort that go into each department, and the comparison of cities, schools, classes, teachers, textbooks. As teachers we want to measure methods, so we shall not have to fall back on vague opinions, such as "I believe," or "It seems to me." We should help the time to come when we shall *know* which method to use. So we may wish to know the standing of this year's grade as compared with last year's,

whether boys or girls learn faster, and the like. The ordinary "marks" and "grades" no teacher ever escapes,—and they involve measurement. Let us see just what it means to measure.

The nature of measurement.—Measurement is accurate comparison—so accurate that it requires numbers to express it exactly. "The father is taller than his son," involves a loose and inexact comparison; but "The father is one and a half times as tall as his son," is a real measurement, in which the son is used as a unit. But the father could be used as a unit; we could say, "The son is two thirds as tall as his father."

Processes as well as things can be compared,—the motion of a cannon ball with that of a horse, or the turning of our watch hands with the apparent movement of the sun, or my memory with your memory. We can measure the speed of a boat by that of a horse, or a bicycle, or the falling of the sand in an hourglass, or a flying bird.

Essentials of good measurement.—The essentials of good measurement are three:

(1) *We must know just what it is we are measuring.* If we are asked to measure "a stream of water," shall we measure its width, or length, or speed of flowing, or the area of a cross section at some point, or its purity, or the energy it expends on a mill wheel? One of these measures cannot take the place of another. When we measure "memory," is it best represented by (1) the number of repetitions necessary in committing, or (2) the length of time the impressions last, or (3) the total amount that can be reproduced at the end of a given time? Also, are we to measure memory for music, for words, for tastes, for old emotional experiences, for thoughts, or for what? If we are to say that one stream

is twice as large as another, or that one man's memory is twice as good as another's, we must define exactly what we mean.

It often becomes necessary to define the *conditions* under which a quantity is measured. If one measures his memory first under ordinary conditions, and then again after a sleepless night, he obtains two very different results. Scientists generally have learned to specify the conditions of their measurements, such as the altitude at which a barometer reading is taken; but teachers often forget this precaution.

A certain college student made 53 per cent in one test in German and 100 per cent in the following one, a month later. He was ill when the first test was given, but determined not to miss the exercise. It would be a gross wrong to insist on examining a student who was not "in condition." * One might as well measure a stream after a drought. So any teacher who will carefully call back the experiences of her childhood, with its short-lived and treacherous memory for school subjects, should find it easy to explain how the

* "A bit of personal experience illustrates the difficulty of eliminating irregular test conditions, and the futility of absolutely following any system of scoring. On one of my out-patient days, I had examined eight patients, one after the other. I had no luncheon and was fatigued physically and mentally. At 5 o'clock a social worker insisted that I examine, as I had agreed to do, her 15-year-old patient. I pleaded weariness and disinclination, but finally decided to give the Binet tests. The patient had waited hours for her examination and was tired and unhappy. After much effort she utterly failed to achieve the 10- or 11-year Binet tests. I declined to give an opinion, but made another appointment for the next morning, when, after the patient had been put at ease and got acquainted, she readily tested up to her full age. The result the night before was really a record of my own mental state."

Walter E. Fernald, "The Diagnosis of the Higher Grades of Mental Defect," *American Journal of Insanity*, Vol. LXX, No. 3, Jan., 1914. Used by permission of the Johns Hopkins Press.

teacher in the grade below "could ever have passed," last June, the very pupils who, here in September, "can't even do what they are supposed to have learned last year!"

It is essential, then, to know (a) just what it is we are measuring, and (b) the conditions under which it is measured, in so far as they affect the result. We must not measure the speed of the wind to-day and assume that the result holds good for yesterday. Nor can we measure a child's eyesight or moral conduct or attainment in arithmetic this year and be sure that the same measures will hold for next year.

(2) *We must have a reliable standard with which to measure.* We measure cloth with a yardstick, butter with a pound weight, time by the movement of watch hands, knowledge by the examination question. If the yardstick is elastic, now long, now short, if the watch ticks off first a quick hour and then a slow one, if one examination question is harder than another but each counts ten per cent, then there is as much guesswork in the result as there is variation in the standard.

(3) *We must apply our standard with great care.* If we are to measure cloth we must place the end of the yardstick where the cloth begins, leave no gaps unmeasured, and go on to the end of the cloth. If we are to measure a pupil's knowledge, we must begin where the knowledge begins, leave no gaps unmeasured, and go on to the limit of his knowledge.

A practical problem in pedagogical measurement.—A boy has handed in an examination paper in arithmetic: (1) Precisely what are we trying to measure? (2) What is our standard of measurement? (3) How shall we apply this standard so as to measure accurately?

(1) Is this examination paper designed to measure the boy's ability in the whole subject of arithmetic, or in one topic, chapter, or even a single operation? Shall "effort" be considered? If the paper is legible, but not neat, shall it be marked down, that is, are we to include neatness in measuring arithmetical ability? Shall very good or very poor attendance during the month make any difference? If the work is unsatisfactory, say at the opening of the year, but the teacher can discern signs of promise; or if the student is likely to become discouraged over his low mark and continue to fail, shall the mark be raised? And are we marking the *paper* in and for itself alone, or are we to make inferences from the paper as to the nature and ability of the boy who produced it, and mark *him?*

Theoretically we should measure one simple thing,—let us say it is proficiency in this month's work in arithmetic. Marking the paper should be like reading off the position of the finger on a scale. If other matters must be considered they should be marked separately if possible. Thus one often finds on report cards a special column for "Neatness." *Practically* the mark is a means of communication between teacher and pupil or parent. From this standpoint the large question is, What does the message mean to the one who gets it? It would be wise to add a note of explanation to report cards, and it might be well, under certain circumstances, to allow teachers to refrain from giving a mark.

(2) What standard have we by which to measure the boy's proficiency? Shall each question be regarded as a unit, or each operation,—adding, subtracting, etc.? On a ruler each inch is equal to every other inch; but how can we know that one question or operation is just equal to every other? Practically, we do the best we can to make our questions of

like value. Carefully graded questions, such as are found in the Courtis tests,* are an effort to establish a more reliable standard.

Further, we usually mark according to a scale running from zero to 100. We should be able to represent this on paper by a line divided into ten equal parts, as follows:

0 10 20 30 40 50 60 70 80 90 100

This is correct if we mark that only which appears on the paper. But everyone knows how much easier it is to pass from zero to 10, or from 40 to 50, or from 70 to 80, than is to climb from 90 to 100. If then the mark includes an estimate of effort, each succeeding per cent will be longer as we approach 100, and our scale will appear somewhat as below:

0 10 20 30 40 50 60 70 80 90 98 100

If two boys start with equal ability, but one works hard enough to win 100 while the other reaches 50, the first has worked much more than twice as hard as the second, and deserves much more than twice as much "credit." †

* See the References at the close of the chapter.

† "The student of telegraphy may have little trouble in 'sending' ten or fifteen words a minute, but to increase his speed to the point where he can send twenty or thirty seems to take much more than double the time and effort required for the simpler achievement. The young teacher may quickly reach the point where her supervisor will grade her instruction and discipline as 'B,' but years of strenuous and persistent work may be necessary before the grade month after month is recorded as 'A plus.'" (Colvin and Bagley, *Human Behavior*, p. 177. Used by permission of The Macmillan Company, publishers.)

It appears that, if we are measuring *effort*, or *rate of improvement*, a per cent is not a constant unit.

Finally, we should consider whether the "100" which we have fixed upon as the limit of perfection has been standardized by wide and careful use, and so is accepted in other schools; or whether it is merely our own idea, carried in our heads, and so subject to change.* Even good teachers sometimes permit each class to fix its own standard, grading a few of the best pupils "A," and distributing the others through the lower grades. The best pupil in each class, whatever his attainment, sets the standard for that class. This makes it easier to arrange the papers in order from best to poorest, which is all that is necessary to find *rank within the class*. Such a method is satisfactory if we wish merely to award a prize to the one of highest rank; but it fails to furnish a satisfactory standard by means of which to compare class with class or school with school.

(3) How shall we apply our standard so as to measure accurately? If the boy can make zero in our examination and still know anything about the subject, we are not measuring his whole attainment; a part of it lies below our zero. In other words, the examination is too hard. On the other hand, if he can reach our highest mark, say 100, without exhausting his power, again we fail to measure it all. The situation is like that of weighing a 200-pound man on a 100-pound scale. The examination is too easy.

Further, there are probably great gaps in the boy's attainment which are left unmeasured. The ordinary examination is not so much like measuring a line from end to end

* Professor Josiah Royce of Harvard has humorously suggested that students of various grade be kept on hand as standards by which to measure our classes, as we keep our yardsticks to measure cloth!

as it is like picking a few random samples from a crate of eggs to test the quality of the whole crate. Perfect thoroughness and fairness would require that we open every egg. Perfect thoroughness and fairness in an examination would require the asking of every possible question.

Suppose the boy has given an answer that is partly correct, perhaps showing the right method but a wrong answer. How much is that worth? It is surely better than no answer, as an egg not strictly fresh is better than no egg. Besides, all the untested eggs and answers whose sample is found but partly good may themselves be thoroughly good.*

What can we do?—We cannot yet measure the schoolroom attainment of our pupils with great accuracy. But we can at least try to keep clear as to (1) what we are measuring, (2) what our standard of measurement is, and (3) how we shall apply the standard. If our marks in any subject are to be influenced by neatness, spelling, effort, and the like, we should tell our pupils so frankly. Perhaps one might even fairly include class attendance, if the fact was understood by all. Of course, the more things we try to include under one mark, the less accurate that mark will be.

Many praiseworthy efforts are being made to establish standards for us. Such are Hillegas's "Scale for merit in English composition," and Thorndike's "Graphometer." † Perhaps some day we can have phonograph records of exemplary reading, oral language, song, declamation, and

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* The practice of allowing no credit for an answer that is partly right, is unfair. It is like declaring that six inches is not a foot, and is therefore zero. We should conscientiously give credit for such virtue as the answer manifestly contains.

† For both, see Edward L. Thorndike, *Education*, § 49. Those who read French will find Binet and Simon's *Educational Ready Reckoner* interesting. See Alfred Binet, *Les idées modernes sur les enfants*, p. 27.

topical recitations for each grade, with standard papers in arithmetic, spelling, etc. Such standards, well worked out by a committee of psychologists and educators, and distributed over the country, would be of great value.

For measuring inborn ability (as contrasted with attainment, which results from training), we have the Binet tests, and others too numerous to mention. (See References at the end of the chapter.)

The expected distribution of marks in a class.—If we collect a thousand men at random, the mathematician can tell us in advance about how many of the thousand will measure six feet in height, how many five feet eleven inches, and so on for all the heights there are. Similarly he can calculate the number of the general population, or of a large school, or a body of teachers,—who are likely to stand high in any trait, the number of mediocres, and the lows. This is of special interest to teachers, for it can be applied to examination marks in some classes. Thus we find Dearborn saying that if we divide the base line of a theoretical curve into five equal parts in order to secure the same range of abilities, we should secure the following percentages in each grade in a normal distribution: *

A	B	C	D	E
Excellent	Good	Fair	Poor	Failure
2%	23%	50%	23%	2%

In a class of 100 pupils, then, we should expect to find about two A's, 23 B's, and so on. It is well for teachers to know this as a general guide in marking. It is well to know also that it cannot be applied safely to small classes or specially selected groups.

* Walter Fenno Dearborn, *School and University Grades*, p. 17.

At the opening of this chapter, it was said that education can become exact if it can measure. While it is difficult, as shown above, to make any single measurement accurately, yet we can reach a reliable result through many approximate measurements. But a discussion of this topic would carry us beyond our present purpose.

FOR FURTHER STUDY

1. What is the best way to find the excellence of oral reading? Of silent reading? How preserve a fixed standard in each case?

2. Do you defend the absolute standard of marking, or the practice of using a different standard for each class, according to its ability? Why?

3. Show some differences between serving as a judge at a speaking contest and serving similarly at a jumping contest. In the first case, need the judge be himself a speaker? In the second, need he be a jumper? Why?

4. What would be the best way to find out whether "the schools used to be away ahead of what they are now," or whether "writing and spelling were twice as good twenty years ago"?

5. "What, you got a hundred in arithmetic this month? Then you must know it all! You won't have to study it any more." Where is the error in such a remark?

6. How would you measure the relative values of two methods of teaching reading, or fractions? (1) Just what are you going to measure, (2) what shall be your standard, and (3) how can you apply it?

7. For many purposes, approximate measurements are sufficient. Should we strive for great accuracy when assigning marks to pupils? Why?

8. Do you think it wise to determine in advance that daily recitation shall count for three fourths, examination

one fourth, etc., in making up grades; or is it better to have no fixed rule, but assign each mark according to the merits of the individual case? Why?

9. When several teachers independently grade the same paper, their marks sometimes vary considerably. Why is this?

10. Should a teacher know whose paper she is marking? Can she not mark with greater justice if she does have full knowledge? Discuss this.

11. Should attendance be allowed to influence class standing? Why?

12. A bright student who has been out of school for some time enters a class rather late in the term, does a great deal of poor work, but at the end of the term is leading the class. Should his previous poor work be considered in making up his term average? Why?

13. What is the value, from the standpoint of pedagogical measurement, of seeing exhibitions of work done in other schools? Should you like to have samples published in educational journals and books?

REFERENCES

Courtis, S. A., *Courtis Tests in Arithmetic*. (Obtained from the author, 82 Eliot St., Detroit, Mich.)

Dearborn, Walter Fenno, *School and University Grades*. (Bulletin No. 368, University of Wisconsin.)

Galton, Francis, *Inquiries into Human Faculty*, article on "Statistical Methods."

Thorndike, Edward L., *Mental and Social Measurements*.

———, *Education*.

Whipple, Guy Montrose, *Manual of Mental and Physical Tests*. (Revised Edition.)

PART FOUR

TEACHING AS CONDITIONED BY SUBJECT MATTER

CHAPTER XX

THE PROGRAM OF STUDIES *

"A casual glance at pedagogical literature will show that we are much in need of an ultimate criterion for the values of studies. . . . At present we are apt to have two, three, or even four different standards set up. . . . There is no conception of any single unifying principle. The point here made is that the extent and way in which a study brings the pupil to consciousness of his social environment, and confers upon him the ability to interpret his own powers from the standpoint of their possibilities in social use, is this ultimate and unified standard." †

"The best way to avoid undesirable uniformity in schools is to push steadily toward the individualization of instruction by reducing the number of pupils assigned to one teacher. The larger the number of pupils assigned to one teacher, the greater the inevitable uniformity of method and pace, and the smaller the account that can be taken of individual peculiarities, good or bad. . . . To the individualization of instruction will be added, in time, the careful study of each pupil's temperament, constitution, and mental aptitudes and defects. . . ." ‡

EXERCISE.—Make two lists of all the branches you have ever studied, beyond the "three R's." Arrange the first in the order of your liking for the studies at the time when you pursued them, taking care not to be influenced by your

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* *Course of study* refers to the work of a particular branch, as the course in arithmetic; a *curriculum* is a group of studies (courses) pursued by a given pupil or class of pupils; *program of studies* includes all the branches taught in a given school system. This is the terminology adopted by the Committee on College Entrance Requirements.

† John Dewey, *Ethical Principles Underlying Education.* Used by permission of The University of Chicago Press.

‡ Charles William Eliot, *Educational Reform.* Used by permission of The Century Company, publishers.

attitude toward teachers, classmates, surroundings, etc. Arrange the second list in the order of benefit received from these branches. How do the two orders compare? Ask some of your mature friends to make similar lists for you.

We found (in Chapter III) that method in teaching depends on (1) the child, (2) the teacher, (3) the world, and (4) the educational ideal. We have studied (in Part Two) "Method as Determined by the Nature of the Child," and (in Part Three) "Method as Related to the Teacher." We now take up "Teaching as Conditioned by Subject Matter." This subject matter is found in the program of studies. The program of studies is the teacher's kit of tools. As such, we should respect it and learn to use it as its nature demands; but we should not reverence it, or regard it as changeless or more powerful than ourselves. Like other frail things of human origin, it is made by somebody, for something. Who is the somebody? What is the something? How can we best use these branches of study to achieve our educational ideal, to develop each pupil according to his nature, so as to make him most useful socially?

The program of studies represents "the world."—It might be ideal if we could compress all the space and time known to us into the limits of a child's experience. Let him watch the formation of our solar system, help build the tower of Babel and invent a language, grow up as fast as arithmetic and geometry developed instead of being born a few centuries behind and struggling to catch up, participate in the painting of all pictures, repeat all inventions, sail and suffer with Columbus, and finally vote at the next election. Granted a brain which could take in all that and assimilate it, and our graduate of the university of the world would far outrank all living men.

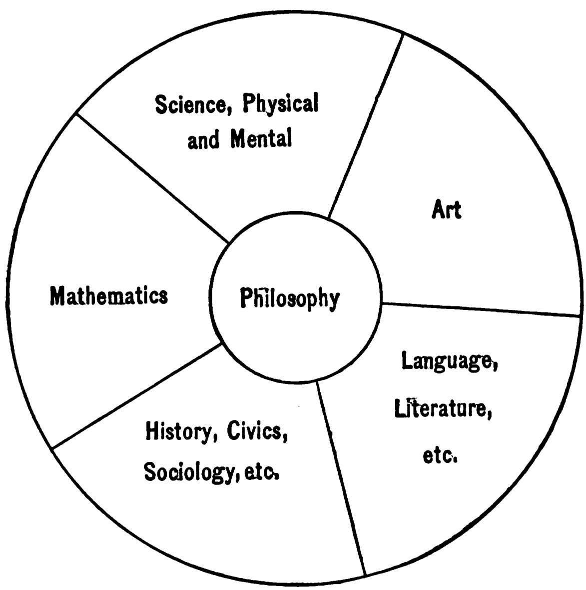
Such a curriculum, if ideal at all, must remain nothing but an ideal. Even if the material were at our command, no mind could master it all; representative parts only can be appropriated. No one head, even the greatest, contains all the science, or the literature, or the history of the world, or even one science, one literature, the history of one country. As we cannot all assemble at our state capital to participate in governmental affairs, but must choose representatives who stand for us, so we cannot take all the world into our heads, or our hearts, or our schools, but must choose certain representative knowledges and bits of skill, type studies which stand for a great deal that we shall never master, mere tastes and samples of great stores of good things.

What this world knowledge is.—Where does the world get this mental wealth from which we select representative parts for our courses of study? We have already seen (in Chapter I) that if men want to survive, they must beat nature at her own game, so to speak. At least they must understand and perhaps control some of her operations. Man wants food: he learns how to facilitate its growth from the earth. He needs clothing: he learns to card, spin, weave, sew. He wants shelter: he learns to chop, quarry, build. All our knowledge has come from our needs, either such as the grosser ones mentioned, or the more subtle need to know for the pure sake of knowing.

Having made a place for himself in the world and acquired a little leisure, and having done so much and learned so much that he or his posterity was in danger of forgetting and losing something of value, he began to record the big things on stone, wax, paper, by means of knotted strings, and in other ways.

Much of value has no doubt been lost; but the more important the knowledge or skill, the more likely was it to be preserved, either by the art of scribes and printers, or by unceasing practice. It is this mighty bulk, then, inherited from the past, together with the present world and all its activities, from which we choose the material for our curriculums.

A schematic view of all knowledge.—Partly because various interests, such as those in science, art, and history, tend naturally to separate somewhat, partly for the sake of systematic study, the whole kingdom of our educational possessions is divided into provinces, as shown in the figure.



It must of course be understood that these fields of knowledge are not sharply separated from each other so far as

subject matter is concerned. The human body, for instance, may be worked over by natural science, or mathematically, or historically, or linguistically, or artistically, or philosophically. The chief difference is one of interest, need, *purpose*.

At the heart of all stands philosophy, whose purpose is to criticize and unify and systematize the whole, to turn all these fragments into a *uni*verse, to give us one grand view of everything that exists, taken together.

Should each child work in all these departments constantly?—Below is shown the form of school organization which, until recently, prevailed almost everywhere throughout the United States:

Kind of school		*Grades or years*
Elementary	Primary	1, 2, 3, 4
	Grammar	5, 6, 7, 8
Secondary	High	9, 10, 11, 12

However, it was the all-too-common experience that this system left, between grammar school and high school, a break, or "gap," across which many pupils failed to make their way. Accordingly, there is now a strong and commendable tendency, already effective in wide areas, to organize grades seven, eight, and nine into the Junior High School. This makes the plan appear as below:

Kind of school		*Grades or years*
Elementary	Primary	1, 2, 3
	Intermediate	4, 5, 6
Secondary	Junior High	7, 8, 9
	High (or "Senior High")	10, 11, 12

Since the purpose of the curriculum is to introduce the child to his world, curriculum makers often assume that each of the departments of knowledge (named in the diagram) should be represented by one or more branches during each year of the pupil's school life.*

To give the pupil a chance to develop in all these ways is certainly good; but to insist that he shall expand constantly and equally in all directions may do violence to his native interests and really hinder his development.

Who should make curriculums?—The answer is, (1) he who best knows the child, (2) he who best knows the world, and (3) he who best knows the educational ideal and how to attain it. He should also know himself well enough to avoid the common blunder of emphasizing his favorite branches. The mathematician would have everybody thoroughly dosed with mathematics; the musician cannot believe that the unmusical are truly educated. It would be wise to assemble specialists in the lines enumerated, and let the curriculum be their joint product.

When it became common for each school system to employ a superintendent, he grew to be, in many instances, a man of authority, who handed out from his office a ready-made curriculum and then administered it by calendar doses, so much a day or month. No college president or board of trustees would adopt such a practice. Each professor practically makes his own course of study and ad-

* Thus, in the primary grades we find number work (mathematics), nature study (science), history stories, language exercises, and writing or drawing; and so on through, until in the last years of the high school we come upon such subjects as trigonometry, chemistry, general history, Latin, and stenography, advanced drawing or color work, music, etc. Philosophy, being a discipline for mature minds, is usually found in college curriculums only.

ministers it. It is true there is a wide difference between these two situations; but it is also true that the practical wisdom of the teacher, who stands next to the child, is often greater than that of her more highly educated superintendent. She should insist on her right, so rapidly becoming recognized, of assisting in the making of curriculums and courses of study.

What should guide us in selecting material for our curriculums?—The following, though not the only principles to be observed, seem to require most emphasis.

1. *Each child should have his own curriculum.* This, one might almost say, is at once impossible and inevitable. Public school systems can hardly be expected, as yet, to employ an expert to plan elaborately for each pupil individually. Yet try as we will, we cannot teach all parts of a rigorous and ready-made program of studies to all children; each will inevitably pick and choose for himself. But we should *encourage* this picking and choosing, not tolerate or repress it. It is folly, to be condoned as an act of necessity only, to determine in advance just how many minutes a week each fifth-grade child shall spend on arithmetic. It is hard to say whether this is better or worse than the old country-school method of allowing each child to work at each subject just so long each day as he felt like working.

2. *Expose the child to a large environment, and develop to the moral limit the chief interests called forth.* This does not mean that each child must cover the earth in his travels, although it is desirable that he should see both city and country, and as much (of the moral side) of each as possible. If Madame Montessori has developed anything new and useful to American pedagogy, it is the principle of letting the child alone sufficiently to study him and learn his traits,

interests, and abilities, as a help in deciding what kind of education he should have. Physicians have taught us that diagnosis must precede treatment, and this holds true of the normal child, as well as of the abnormal.

A farmer buys a puppy without inquiring as to its blood, expecting to train it into a good farm dog. It turns out to be a poodle. A teacher receives a pupil and straightway begins rigid number drill to develop some general mathematical ability. He turns out to be a poet, a historian, an artist, or a moron (a defective), who can never get quite through the multiplication table. Abilities differ. No curriculum can create abilities that are not born in the child, but it may leave them undeveloped and dormant if they are born in him. Hence the need of the wide range of (moral) environment to awaken whatever slumbers in the soul.

But does not this mean specialism from the cradle? Yes; and we cannot wholly avoid it if we wish to; but we should not wish to. Not that each should know his little specialty only; for it is perfectly true that the educated man should know "something about everything and everything about something." But a tree grows from the trunk outward. As soon as we find the center of a child's interests, let us make his favorite study, so far as possible, the main body of his curriculum. To know his hobby wholly he must radiate out into every other branch, and these otherwise unwelcome branches become tolerable because they are bound up with the best beloved.*

* A case in point is the anecdote of G. Stanley Hall as he tells it in *Adolescence*, Vol. I, pp. 129–131. He found that the study of a single muscle of a frog's leg compelled him to learn something of electricity, mechanics, the anatomy and physiology of other tissues, chemistry, mathematics, and the history of biology. He read all summer, and

Interests and abilities may change and shift with age. For this reason we must subject the child again and again to the presence and stimulus of the music, mathematics, or other branch to which he does not at first respond, in the hope that love (or at least respect) for it and proficiency in it may yet develop in their own good time. For it is a well-known fact that abilities do have such "nascent periods," and that neither the time nor the order of their development is the same in all children,—another reason why no one curriculum can be made to fit all.

3. *So far as possible the pupil should participate in the real life of the world, not merely in a reproduction of it.* The school, separated from the world, runs the danger of becoming systematized mimicry, a play, an imitation, a mirror of life instead of life itself. We make toy mountains of sand while nature's product stands neglected at our door; we memorize ancient history and neglect the history that is being made; we toy with tools and often remain ignorant of actual shop life. There is no such thing as real preparation *for* life without real participation *in* life. But the young child should see the good only; he may behold the bad when his good habits have grown firmly fixed.

4. *The curriculum should face toward the future rather than*

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then began a second year of research on the muscle "with the most eager curiosity and zest."

"As the work went on," he says, "I felt that the mysteries not only of motor education and morality, but of energy and the universe, centered in this theme. . . . In fine, in the presence of this tiny object I had gradually passed from the attitude of Peter Bell, of whom the poet says 'a primrose by a river's brim a yellow primrose was to him, and it was nothing more,' up to the standpoint of the seer who plucked a 'flower from the crannied wall,' and realized that could he but know what it was 'root and all and all in all,' he would know what God and man is." (Used by permission of D. Appleton and Company, publishers.)

the past. The pupil is always a modern pupil who will spend most of his days in a world more modern than our modern present, the world which the future will develop out of this present. Consequently, the study of boy scout tactics or the practice of the fire drill is likely to prove more valuable than a study of the way Cæsar drew up his forces on certain occasions; modern English is probably worth more than most ancient languages or literatures; and it augurs well for citizenship if there is an even keener relish for current events than for ancient history.

Nevertheless, individuality should still count. If there is found one who persistently throws down the newspaper to take up ancient history, he should have such history to his satisfaction; but let us hope that such can learn to feel some interest in the world they live in, because it grew out of that past in which they would like to live.

Are there any branches that must be mastered by all?— It is of course altogether desirable that all the children of a country learn to speak, read, and write a common language, know how to care for themselves, body and mind, how to recognize and secure good food and housing, how to transact simple business, make a living, and at the same time understand something of the civil and social doings of their own and other nations. It is not rash to hope and expect a much greater acquisition than this on the part of most of our youth. But no rule of "an average of seventy, with no mark below sixty" should be enforced, even for this modest list of desirables.

Beyond the merest elements of a few studies, there is no branch that is absolutely essential to an education. Whoever has found the purpose to which he can whole-heartedly devote himself, so that he can say of it, "To this end was I

born and for this cause came I into the world," has either attained an education or is safe on the high road to such attainment.

FOR FURTHER STUDY

1. Which is the most valuable subject in the program of studies? Why? Why do not all give the same answer?

2. Do you believe in elective studies? Why?

3. Who made the program of studies in your school? When?

4. Describe what you would regard as an ideal program of studies.

5. In which department of the world's activities, mathematics, science, etc., are you likely to specialize? Why?

6. Is it best to separate the "monotones" (those who sing but one tone) from the class of capable singers? Why?

7. At what age can the student be trusted to make his own curriculum? Would this age be the same for all?

8. Why should we have the past represented at all in the curriculum?

9. Why is the history of literature commonly studied, while the history of mathematics is commonly neglected? Should this be so?

10. Can the primary teacher be trusted to make her own curriculum? Why?

11. Who should determine what English classics a student shall read?

12. Why is not Hebrew taught in our high schools? Why are Greek and Latin taught in many of them?

13. Outline an argument for uniformity in the studies to be pursued by all the children of a school system.

14. Outline an argument against uniformity in the studies to be pursued by all the children of a school system.

15. If variation is permissible in high school curriculums, why not in those of lower grades?

16. State several reasons why the number of pupils assigned to each teacher is so important.

17. How would you solve the problem of correlating studies? Can we, apart from the child, insure correlation by any clever contrivance in the way of arranging studies? Why?

18. In the manual-training shop the chief punishment (in at least one city) is the loss of the privilege of working there. Why is not a similar loss of privilege an effective punishment in all classes? Should it be?

19. Can we get an education more rapidly, by searching out and persistently engaging in those tasks which are especially difficult and disagreeable for us?

20. If pupils were pursuing studies in which they took pleasure, would it be safe to remove the necessity of working to pass a grade?

REFERENCES

Charters, W. W., *Methods of Teaching*, Chs. II, VII.

Eliot, Charles William, *Educational Reform*, Chs. VII, XI, XII, XIV.

Hanus, Paul H., *Educational Aims and Educational Values*, Chs. I, III.

Strayer, George Drayton, *Brief Course in the Teaching Process*, Ch. XVIII.

Thorndike, Edward L., *Education*, Chs. VII, VIII.

CHAPTER XXI

SCIENCE

"We believe, therefore, that *these practical applications of science to life as a child meets them in his home and surroundings are the entrance way to science.* They furnish the points of contact between man and nature, especially those points of contact which are manifest to all and first attract a child's notice. . . . The teacher in the laboratory is apt to think he can grade a much simpler series of experiments in his laboratory than outside life can furnish, and this may be true. But the *motive* for the demonstration and its later *bearing upon life* are both apt to be overlooked in such pure laboratory work. When once a good problem has been raised in life, it may be well to use all the devices of the laboratory to illuminate and clear it up; *but the source from which the problem came, and the final reference of the whole experiment to its life application, are the things not to be forgotten.*" (Italics not in original.)*

EXERCISE.—Describe the mental condition, and the situation with regard to environment, of one who has reached the age of twenty, but has no scientific information. Mention, in particular, the dangers to which he is exposed.

Nature of science.—We have seen that man is in the midst of an environment composed of mighty forces which will keep him safe if he learns how to coöperate with them, but which will pitilessly destroy him if he remains heedless of them. A little study will show us that the scientist is always doing one of two things: either he is collecting facts, observing; or he is trying to make out what his facts mean—he is

* Charles A. McMurry, *Special Method in Elementary Science.* Used by permission of The Macmillan Company, publishers.

thinking. In knowledge-getting, then, the two great and essential processes are *observing* and *thinking*.

Accordingly, all knowledge is either observed, or thought out, or both. This gives us four kinds of knowledge, thus:

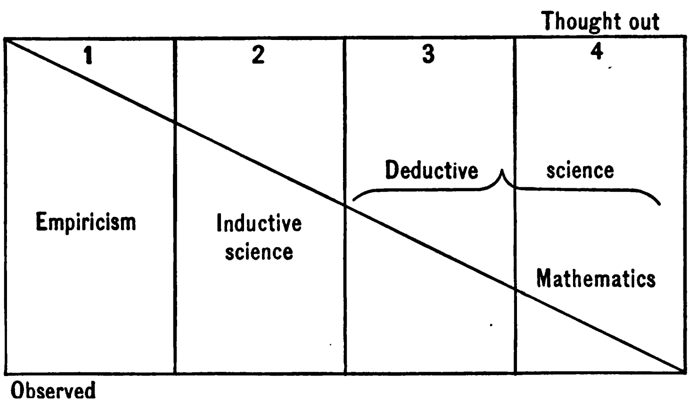
1. Observed but not thought out, as the fact that war followed the appearance of a comet.

2. Observed and then thought out, as the growth of plants and the laws controlling it.

3. Thought out and then observed, as the prediction of an eclipse and its later observation.

4. Thought out but not observed, as the condition of the interior of the earth.

A figure may help to make plain these four classes, and the position occupied by science, commonly so called.



Showing the four classes of knowledge listed above. All to the left of the diagonal is "Observed," all to the right of it, "Thought out."

Empiricism relies almost wholly on observations which stand as unrelated fragments, not rationalized, not bound together by any law or principle. It can easily believe that wars follow comets!

Inductive science, geography, botany, chemistry, psychology, etc., keep close to the facts, but attempt to include these in generalizations, to explain them, find laws for them. Each no sooner imagines a possible law than it returns to the field of observation to see if the law works.

Nor is there any sharp dividing line between inductive and deductive science, for both induction and deduction are found to some extent in all sciences. The better developed a science is, the more laws it has found, the more can reasoning run ahead of observation; and this placing of reasoning first and observing second is exactly what makes a science deductive. As soon as any science succeeds in finding a law that fitly assembles and joins a wide stretch of our jig-saw puzzle of facts, that law seems as certain as the facts themselves, a reliable source from which to infer new truths. So the law of gravity, established by a long process of induction, is now the safe support on which to hang a legion of deductions. Physics, with its many old and thoroughly tested laws, is preëminently the deductive science, mathematics excepted.

Value of science to the world at large.—It is the great service of science, especially of that science called "natural" (as distinguished from mental, social, and historical science), to enable us to win in the contest with our natural environment. Man must learn how to get from this natural world the wherewithal to live, to keep his fires burning, his cellars filled, his body free from disease.

Herbert Spencer established five grades for the value of knowledge, according to the aid it gives in (1) direct self-preservation, (2) indirect self-preservation, that is, securing the necessaries of life, (3) the rearing and discipline of off-spring, (4) the maintenance of proper social and political

relations, and (5) the miscellaneous activities of leisure. It is evident that science scores heavily on every one of these points. There is scarcely an object in our environment or a moment of our day that does not remind us of its constant benefits. Take away what science has contributed, and man would begin again at the stone age.

The purpose of science in the schools.—Since the aim of education is the same as the aim of life, the purpose of science in the schools is the same as it is in the world at large, to teach the rules of the life-and-death game which we are all playing with our environment. Our chief aim, then, is a very practical one: to teach our pupils how to deal successfully with everyday problems that demand scientific information, how to avoid disease, take care of the body, earn a living.

When a city such as New York has in its public schools lectures on the care of babies, it extends the usefulness of public school science to "the rearing and discipline of offspring," Spencer's third class of knowledge value.

Further, as the pupil passes on through grammar grades and high school, he learns to appreciate the method by which facts and laws are established,—he can establish some for himself. This should make him cautious as to his own statements and critical of the statements of others, not in science only, but everywhere and always; should teach him to trust, not merely what has been said over and over so often that it ought to be true, but that which can stand every test that science can bring to bear on it.*

Finally, we all wish to enjoy this beautiful, wonderful world. Merely to contemplate it, to gaze upon its miracles, sometimes as fearful bulks in the dark, sometimes illumined

* See the quotation at the opening of Chapter I.

by the spotlight of clear understanding, to throb with sympathy at the thought that we are eternally a part of it,—this is the joy of the disciple of nature.

Subject matter and method.—Subject matter here as everywhere should consist of what is most interesting and most practical, what the pupil needs and what he likes, in so far as these can be joined together.

One of the surest ways to hit upon the right method is to ask ourselves what kind of lesson we are trying to give, whether it is for information, thought, skill, or appreciation. Having decided this, perhaps the greatest danger lies in the fact that since methods in science work below the high school are still in an unstable state, and since the teacher is likely to have had some advanced training, he will attempt to repeat both the matter and the manner of his own learning. In the information lesson, for example, where description is often called for, it is most deadening to young enthusiasm to be put into the strait-jacket of systematic and minute analysis as this is found in advanced textbooks. And in the lesson for thought, we should beware how we bring the definition (say that of a machine) into the classroom, and leave the thing defined outside.

Both subject matter and method, below the high school, are still somewhat loose and rambling. In nature study especially, there is no established course. But the general relation between the work in "the grades" and that in the high school seems likely to become the same in this branch as in others; in the elementary school the watchword is *observation;* in the secondary school, *demonstration.* In the grades everything is *psychologically* organized about the pupil as a center; in the high school, while we do not disregard the learner, we find that his developing mind demands

a more closely wrought and *logical* organization of subject matter. He must know the *why* of things, must do the thinking out as well as the observing.

Branches of science in the elementary school.—All natural science grows out of nature—*is* nature study more or less advanced. Out of the nature study of the primary school develop two branches, the *personal* and the *environmental*. The science of personal welfare is hygiene and physiology; the science of the environment is geography.

$$\text{Nature Study}\begin{cases}\text{Personal science: Hygiene}\\ \text{Environmental science: Geography}\end{cases}$$

Nature study.—The great difficulty with this subject is its bulkiness. The conscientious teacher is likely to feel that, however hard she and her class may delve, they are sure to leave a legion of valuable facts untouched,—perhaps the very ones on which most emphasis is laid in some neighboring school system. But we should be glad of our infinite abundance; what if we had but one season, no insects, but one kind of animal and two or three plant types! Nature has settled the question for us; there is no hope of possessing all her wealth; we can only collect a coin or two from each of her treasuries. We must study individuals and let them stand as representatives of multitudes of their kind.

The essential points are (1) to find something interesting, (2) which is also useful, and (3) to study it at first hand, going out to find the objects in their natural setting whenever possible, using schoolroom or museum samples when necessary, and resorting to books for supplementary information chiefly. As it is difficult to find anything really useless, the principle of *interest* can be given pretty free play. This is sure to result in the usual arrangement of material

by seasons or months. But it ought not to be difficult for the childish interest to embrace, each season, (a) something of inanimate nature, the falling snow, the summer heat, (b) representative plants, and (c) typical animals. Such a program will vary with different latitudes, environments, classes, but in every case it should insure the *enjoyment* of nature; an understanding of the *relations of its parts*, as the office of insects in fertilizing plants; and the ability to turn the knowledge gained to *practical account*, as the boy scouts and campfire girls do in their various devices.

The child is rare who is not interested in some phase of nature. The course may well begin in the toy age, and we should endeavor to preserve its continuity into the more rigidly organized high-school science. There must be no sharp break between the two. The recognition of this fact has led us to place "elementary science," with its easy experiments from physics, chemistry, etc., in the upper grammar grades. It affords a practical, concrete introduction to the science work of the high school.

Hygiene and physiology.—The object of this science is the preservation of the person. Our aim is not so much to take the offensive and conquer our environment as to strengthen our defenses against the enemy, seen and unseen.

Personal hygiene "includes everything that bears upon the health of the human body. Such a scope would include the various sub-topics connected directly and indirectly with the following subjects: Bodily nourishment, including food, water, and air; the excretions; exercise; rest; the influence of abnormal conditions on health, e. g., defective vision, bad teeth, adenoids, constipation, etc.; the influence of certain habits on health, e. g., rapid eating, bad habits of vision,

smoking, drug habits, sexual habits, etc.; the causes of disease; the carriers of disease; our defenses against disease; and the nature of our common diseases." * From this we pass naturally to home and school sanitation, medical inspection, community and race hygiene. The course should grade up to a scientific demonstration of these truths in the high school.

Of course the pupil cannot develop all this afresh, as the scientist works it out, but he can acquire a fund of information, can practice good health habits, form ideals. And we can quickly convince him that he is interested in these things if he is interested in living.

Physiology is simply auxiliary here—and psychology too, for that matter. These sciences teach us what the mind and the organs of the body *do;* and the only need the children have for such information is to enable them to care properly for both. This shows us at once the limited amount of physiology to be taught,—merely enough to make clear the hygiene. We should teach, too, at least a little *mental* hygiene, based on psychology: how to begin the day with a smile, cultivate a sense of humor, bring our joviality to the table, cast out all fear. Even children should know these things, and should crystallize their knowledge into pleasant habit.

The method cannot always be observational. It cannot well be so in teaching of disease germs, for example. But this method should be our ideal, and the abundance of pictures and other objective aids helps us much. Health habits, in so far as the school can control them, must be drilled home with kindly but inflexible determination.

* Monroe's *Cyclopedia of Education,* article on "Hygiene, Personal." Used by permission of The Macmillan Company, publishers.

Geography.—In this science we turn from our attitude of hygienic self-defense to an aggressive examination of our environment. We study geography, because we wish to know the kind of world we live in, what it is likely to do to us, and what we can do with it. We want to be able to predict and to control its operations; to know our national neighbors, and how we, as one great human family, can make this old earth yield us all a happy living.

In the light of this, how insignificant become the swarms of little facts which so often clutter up our geography text-books. It is not the petty straits and bays, towns and elbows of rivers that we need to know, but how man, the heaven-born pioneer, has made and is making a home and a career for himself on this none too hospitable planet. Our facts should all be culled with reference to this principle.

Here again we start with the observational method, studying our home geography out of doors, building up apperceptive centers by means of which to interpret maps and descriptions of those parts of the world we cannot visit. Advanced work in geography is very largely the interpretation of such maps and descriptions, as we proceed from our little home areas to larger and larger horizons. Because the map, the model, the drawing, the photograph, and the verbal description are of such inevitable importance, the pupil must become skillful in picturing, mapping, and describing his own geographical surroundings in order that he may correctly interpret such representations of unknown regions. He must not think, as children sometimes do, that New York is red, Pennsylvania green, etc., or that one crosses a visible line in passing from state to state.

The applications of this science form what we may call the geographical arts, the processes by which man earns

from his environment his food, clothing, fuel, shelter. Agriculture, the great food art, is receiving in our schools an ever-widening recognition.

The mental and social sciences.—In considering our adjustment to environment, we must not forget that a large part of the environment of each of us, and often the most important part so far as our success is concerned, consists of other human beings. We must know ourselves, our fellow men, and the relations between us. We must study (or at least practice) psychology, sociology, economics, ethics, and logic.

Of course these can have no place in the elementary school, except in the form of unorganized information and certain wholesome habits and ideals. But the high-school mind is sufficiently mature to profit by the elements of all these subjects in a lively, concrete form. Their general educational value would probably compare well with that of other high-school branches. We need more secondary school teachers who have the ability and training to present these subjects suitably for young people, and more textbooks written for this specific purpose.

FOR FURTHER STUDY

1. State the psychological reasons why nature study cannot be taught from books alone.

2. What value is there in allowing a child to make deductions and test them? How do we train ourselves to foretell the weather?

3. How would you disabuse a child of the belief that the moon controls the weather?

4. If the human race had to sacrifice either its knowledge of history or of science, which could it better afford to lose? Why?

5. "Science teaches us to observe carefully and record accurately." Discuss this statement from the standpoint of formal discipline.

6. "We must not study frogs in the fourth grade, for we studied them last year in the third." Is this sound? Why?

7. State some differences between the study of trees in high-school botany and the study of them in grade five.

8. What, if anything, do you wish had been added to your early training in nature study, hygiene, or geography?

9. How do you account for so much cigarette smoking by boys, when the evil effects of the habit are taught to all?

10. Need the details of the circulation of blood in the heart be taught to grammar-grade pupils? Why?

11. Write a brief essay on "The school garden as a nature-study center."

12. Discuss the values of the following in teaching geography: magazines, moving pictures, post cards, correspondence with distant pupils, stereoscopes, stereopticons, lectures, the school museum, the sand table, the textbook, the blackboard, the copying of maps.

13. Do you agree with what is said about the mental and social sciences? Why?

REFERENCES

Davis, William Morris, *Geographical Essays.*

Dodge, Richard Elwood, and Kirchwey, Clara Barbara, *The Teaching of Geography in Elementary Schools.*

Geikie, Archibald, *The Teaching of Geography.*

Huxley, Thomas Henry, *Science and Education.*

McMurry, Charles A., *Special Method in Elementary Science.*

Parker, Francis W., *How to Study Geography.*

Schmucker, Samuel Christian, *The Study of Nature.*

Spencer, Herbert, *Education.*

Thomson, J. A., *Introduction to Science.*

CHAPTER XXII

MATHEMATICS

"There is probably more time wasted in the teaching of arithmetic than in the teaching of any other subject. Long problems are given instead of short; intricate ones instead of simple; things unlike the operations of actual life instead of what is practical. Children are burdened with dreadful 'examples' for 'home work' which, if solved at all, are solved by the aid of parents or older brothers and sisters. Time is consumed in work which children cannot possibly understand or appreciate. . . . Time was when it was considered sufficient to learn by rote definitions of technical terms employed, to memorize a rule without understanding its reasons, and to apply it to the solution of problems precisely worded. When the rule was forgotten or the problem differently worded, the power of solution was obliterated. But no matter; unreasonable work of this kind was thought in some inexplicable way to train the reasoning powers; the child was supposed to learn to think by a process that required no thinking. The doctrine of apperception has changed all our ideas on this matter." *

EXERCISE.—Ask a class of children to make up some arithmetic problems about the things that most interest them. Compare these problems with those found in the textbook.

Try to secure statements from your friends of middle age as to the value to them of the mathematics they studied in the elementary or the secondary school. How, if at all, would they change the character or amount of instruction there?

The value of mathematics to the world at large.—It would

* William H. Maxwell, *Educational Review*, Vol. III, p. 475. Used by permission.

be hard to overstate the importance of mathematics. Our calendar expresses it, historical events are set in order by it, every natural science mounts by it, all industrial arts are wedded to it. Theorist or practitioner, no one can escape it. Nor does our little world bound it. Other worlds may easily have different history, different botany, different psychology, different literature from ours, but it is next to impossible to conceive of their having any mathematics different from ours.

Yet despite this apparently universal truth and utility, there is but slight demand, in the daily lives of most of us, for anything more than the merest rudiments of number and quantity. They are few who do not need a modicum of mathematics, but they also are few who need anything more. Of course, we all profit by the genius of the expert mathematician, as we do by the devotion of the expert physician, but that is no reason for becoming either kind of expert unless our "call" takes us that way.

Nature of mathematics.—Mathematics is a kind of science. In beginning the study of it, we should make many observations of the world about us, as we do in other sciences. But the peculiarity of mathematics is, that we so quickly pass on from the "observing" stage to the "reasoning" stage. Its generalizations, some of which are called axioms, form the foundation of a great mass of deductions which make up the bulk of the science. It is "the" deductive science.

Mathematics, then, has few (observed) facts to remember, —no such burden of them as we find in geography, botany, or chemistry. It is a thinker's paradise, for a certain kind of thinker.

Educational value of mathematics.—In some quarters

it is still necessary to dispel the delusion that each branch of study has some peculiar mental power to develop. The truth seems to be that any branch of study *can* be so taught that it will train any mental power to act on *that* kind of subject matter, but not, usually, on all kinds. Thus mathematics develops, in one who has the "gift" for it, mathematical observation, mathematical memory, mathematical imagination, judgment, reasoning, feeling.

But it cannot of itself develop the power to reason well on all subjects. "It is more than doubtful . . . whether the severe study of arithmetic would make any material difference in a man's capacity, as a juryman, to draw sound conclusions from a tangled mass of evidence, or as a citizen, to trace admitted governmental evils to their source. . . Facility in the one kind of reasoning is no more a guaranty of facility in the other than is proficiency in playing golf of proficiency in playing chess." * The general truth of this statement has been borne out by the recent developments of experimental pedagogy.

Our chief aim in teaching mathematics to children is to enable them to solve the problems of everyday life, as those problems appear in the household, the market, and the shop. If we accomplish this aim, "discipline" and "culture" will take care of themselves.

This means that it is the *art* of mathematics, rather than the science, that we are trying to impart. We should not care, until the child himself naturally *desires* to understand, whether he can "explain" his addition and long division, his fractional and other operations, or not. But we should care constantly that he perform these operations with speed

* J. P. Gordy, *A Broader Elementary Education*, p. 217. Used by permission of Hinds, Hayden and Eldridge, publishers.

and accuracy. In other words the early lessons in mathematics should not be "thought lessons" only, but observation lessons, information lessons, and especially lessons for *skill*. We are too much afraid of letting our children imitate us in mathematical operations, as they do in skating and shooting marbles. Even problem solving is partly habit.

In addition to this very practical reason for teaching a little mathematics to everybody, there is a special reason for teaching a great deal of mathematics to the limited number who have strong talent for it; it will serve them in their vocations as engineers, architects, investigators. So far as possible, we should teach mathematics to each child in accordance with what he is likely to do with it. One gains merely the art of reckoning, another glimpses the science of number, a third proves to have been born to further the cause of mathematics in the world. Vocation determines the value.

Subject matter.—More and more the principle prevails that subject matter shall be selected according to the needs of the pupils. "What can we leave out?" is the common question, and rightly. We are leaving out of arithmetic such subjects as obsolete or little-used measures and tables, unusually intricate or lengthy problems, progressions, series, compound proportion, annuities, cube root, and many other subjects.* At the same time the stress is ever more and more on the *applications* of such topics as are taught, to practical problems—*pupils'* problems.

The course in elementary mathematics is made more

* From secondary-school algebra we find disappearing the more elaborate method of finding the highest common factor, difficult simultaneous quadratics, all equations beyond the second degree, and other labored and little used topics.

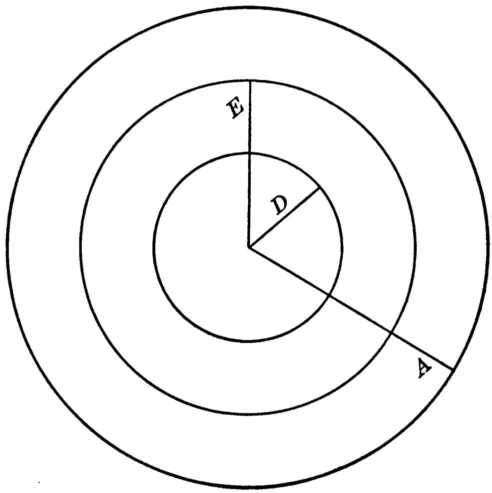
practical, unified, and natural, by combining with arithmetic the simpler (and more useful) parts of algebra and geometry. Pupils no longer exhaust their arithmetical powers and then take up algebra; arithmetic and algebra are so combined in the upper grades of the grammar school that the pupil finds no precise point at which he can say arithmetic ends and algebra begins. He is no longer cramped by the command, "Solve by arithmetic." He solves all problems by the most direct method he can find.*

The grammar school also is coming to have a geometry of its own. The pupil is not puzzled with the abstractions of advanced geometry. He demonstrates by *doing*, studies the geometry of perceptions rather than that of ideas. A line is to him the path of his knife point or a well-sharpened pencil, and not a refined idea with nothing in the outside world quite good enough to correspond with it. He works with things, finding parallel lines in his environment, constructing angles, snipping off the corners of a quadrilateral to show that they just fill in the space about a point, etc. This work is supplemented by that in mechanical drawing.

This brings about a close correlation among the various branches of mathematics. The correlation of mathematical with other subject matter will take care of itself if the mathematics is developed, as it ought to be, from real juvenile needs. The subject matter should be so handled as to extend the child's experience and increase his feeling of mastery. In the figure, if the circle E represents the child's experience, D, falling well within it, gives us the range of material for developmental and illustrative work. But

* There is a strong recent tendency to combine algebra and geometry in the high school. The plan deserves further experimentation.

any principle, having been developed, illustrated, and well drilled in, should be given a wider range of application, represented by circle *A*. A pupil who learns how to get the



volume of a sphere can apply the formula (roughly) to the earth, sun, or moon. The result is similar with new combinations of old things; a boy who knows the circumference of his bicycle wheel can tie a small flag to one of the spokes and measure the distance between home and school.

But it is quite wrong to suppose that we can teach much geography or history or any other subject merely by offering information problems in that subject when teaching arithmetic. This is much like wearing skates when learning to dance, so as to master both skating and dancing by a single effort. A few may succeed in spite of the divided attention and effort.

General method in mathematics.—Speaking generally,

there are but two kinds of work to master in mathematics. They are:

1. Fixed operations, such as addition and multiplication.
2. Problems to which these operations are applied.

1. As stated before, many of the fixed operations should be regarded as acts of skill, learned chiefly by imitating the teacher, and left unexplained. This method should always be followed when the explanation proves to be a stumbling block, as in the case of division of fractions. Let us teach practical *doing*, the art of calculating, whether we teach the elegant science of arithmetic or not.

When it seems likely that a class can get some understanding of the process to be taught, it may be approached as a problem to be solved. The following is suggested as a good type of general procedure.

(a) Let the new truth appear in the guise of a problem. For instance, when the class is ready to work out a rule for finding the area of a rectangle, we may propose the question, How can we find the number of squares in a checker board without counting them all?

(b) Let the pupils solve the problem under the guidance and leadership of the teacher. The work should be concrete and mainly oral. When a rule or principle is developed, a brief statement of it should be formulated and recorded. For example:

$$\text{Area of rectangle} = B \times A.$$

(c) This terse statement should be fixed by repetition and drilled upon orally until it can be applied accurately and readily. Let it circulate all round the class.

(d) Fix the most desirable written form by practice on board or paper, the teacher carefully supervising.

(e) Let the pupils, as independently as may be, apply the knowledge gained to situations which to them are real and interesting problems.

2. The solution of particular problems may proceed somewhat as follows:

(a) Image vividly the conditions of the problem, drawing a figure or picture if necessary, to aid.

(b) Discover just where or how the "answer" must fit in with the rest, and consequently how it can be obtained from the facts given.

(c) Translate the language of the problem into figures, and solve, writing no explanations except such as are necessary to aid the solver himself.

(d) When the answer is obtained in figures, state what it means in the concrete terms of the problem.

Concerning analyses and explanations, so often abused, Dr. Smith is eminently quotable: "(1) To require that every applied problem should be solved in steps is to encourage arithmetical dawdling. . . . (2) To split hairs on such questions of form as 9 × 15c or 15c × 9 is to get away from the essential point. . . . (3) To require no analyses of the applied problems is an extreme that is about as bad as to require them for all, and perhaps worse. . . . (4) To require some particular form of analysis, only to meet the idiosyncrasy of the teacher, is also a danger against which we need to be on our guard. . . . In general, therefore, the teacher should see to it that there is a reasonable amount of rapid, accurate solution, the 'answers' being the paramount object. He should see also that there is a reasonable amount of written analysis, preferably in the convenient form of steps, but not limited in any notional way that would destroy originality or make a solution unnecessarily

long." * Formal, detailed analysis should not be required too early—say before grade seven—but problems should be talked over and reasoned out informally from the very beginning of school work.

The psychology of arithmetic.—Fundamentally, arithmetic is counting up and down the number scale, with the invention of such short cuts as addition, division, etc., to quicken the process. Whatever the adult may make of his concept of number when he analyzes it, there is little doubt as to how the child gets hold of the idea. Out of the "blooming, buzzing confusion" that surrounds the young child, there comes home to him very early the consciousness of changes, and particularly those rhythmical changes that readily form *series*. This series idea is built up from many sources, breathing, running, the clock tick, the drum, the accented notes in music.

The series idea is the basis of the number concept.

The series need not be named at first. The essential thing is that it should be abstracted, that is, separated from any particular concrete objects or events that have helped to build it up. This abstract series idea can then be applied in a manner that seems very much like counting, as in the case of the child who reproduces the strokes of the clock without using number names, saying, for example, "Boom! boom! boom!" when the clock strikes three.

Next comes the learning of the number names. *The first "counting" should not be applied to things*, any more than one would point to objects when repeating a Mother Goose rime. It is purely a memory drill on a series of names. It is important, then, that the numbers be taught in their

* David Eugene Smith, *Teachers College Record*, Jan., 1909. Used by permission.

natural order. Having now gained his abstract series idea named with the number names, he is ready to apply it. Care is necessary that the number names be not applied at random, or regarded as the names of certain individuals. Phillips gives a case of a boy who counted his neighbor's four dogs as follows: "Tip is naught, Bob is one, Nero is two, and Dandie is three." *

The pupil may now proceed to count all sorts of things in which he is interested, using his fingers, the original basis of the "tens" system, as freely as he chooses. Objects also find a large place in the development of addition tables, etc., but the transition from things to pictures of things and then to symbols purely, may follow rapidly. †

FOR FURTHER STUDY

1. It is sometimes urged that pupils should write their problems, because they must certainly think of the problem while they are writing it. Is this argument sound? Why?

2. "Mathematics teaches us to reason." Discuss this pro and con.

3. State the psychological reason for not using, in the very beginning of arithmetic, such general symbols as those employed in algebra.

4. State, in terms of habit, the reason why children should not long continue the use of objects in computation.

5. Show that all arithmetic can be reduced to a matter of counting up and down the number scale.

6. Visit some classes in mathematics, and try to work out the psychological reasons for the errors you find.

* D. E. Phillips, *Number and Its Applications Psychologically Considered*, p. 11.

† The above is offered as a mere hint of a type study in the psychology of number. I believe it touches a critical point, and that a little more of this kind of knowledge would prevent much of the useless rambling so often found in methods of teaching arithmetic.

7. What use can be made of arithmetic in the teaching of algebra?

8. "Mathematical study begets accuracy, the prime requisite of the truthteller, and so has a high moral value." Comment on this.

9. Make a list of those topics in arithmetic for which you have found frequent actual use since you left school.

10. Discuss "The use of imagery in mathematical study."

11. Should models be used in the study of geometry? Why?

12. What proportion of the work in arithmetic should be oral? On what do you base your answer?

13. How should you proceed with the boy who counted, "Tip is naught, Bob is one," etc.?

REFERENCES

Ball, W. W. Rouse, *A Short Account of the History of Mathematics.*

Gilbert, Chas. B., *What Children Study and Why*, Chs. X–XII.

Hanus, Paul H., *Geometry in the Grammar School.*

Hunt, E., *Concrete Geometry for Grammar Schools.*

Phillips, D. E., *Number and Its Applications Psychologically Considered.*

Smith, David Eugene, *The Teaching of Elementary Mathematics.*

Suzzalo, Henry, *The Teaching of Primary Arithmetic.*

Young, J. W. A., *The Teaching of Mathematics in the Elementary and the Secondary School.*

Mathematics in the Elementary Schools of the United States. Government Printing Office.

Report of the American Commissioners of the International Commission on the Teaching of Mathematics. Government Printing Office, Washington, D. C.

CHAPTER XXIII

HISTORY

"We no longer go to history for lessons in morals, nor for good examples of conduct, nor yet for dramatic or picturesque scenes. We understand that for all these purposes legend would be preferable to history, for it presents a chain of causes and effects more in accordance with our ideas of justice, more perfect and heroic characters, finer and more affecting scenes. Nor do we seek to use history for the purpose of promoting patriotism and loyalty; we feel that it would be illogical for different persons to draw opposite conclusions from the same science according to their country or party; it would be an invitation to every people to mutilate, if not to alter, history in the direction of its preferences. We understand that the value of every science consists in its being true, and we ask from history truth and nothing more.

"The function of history in education is perhaps not yet clearly apparent to all those who teach it. But all those who reflect are agreed to regard it as being principally an instrument of social culture. The study of the societies of the past causes the pupil to understand, by the help of actual instances, what a society is; it familiarizes him with the principal social phenomena and the different species of usages, their variety, and their resemblances. The study of events and evolutions familiarizes him with the idea of the continual transformation which human affairs undergo, it secures him against an unreasoning dread of social changes; it rectifies his notion of progress. All these acquisitions render the pupil fitter for public life; history thus appears as an indispensable branch of instruction in a democratic society." *

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* Ch. V. Langlois and Ch. Seignobos, *Introduction to the Study of History*. (Berry's Translation.) Used by permission of Henry Holt and Company, publishers.

EXERCISES.—Write a historical account of some party, game, or other event which you have recently witnessed, and compare your report with that of several others. Do they agree? If not, who is right? Are *all* facts reported?

Compare several newspaper accounts of any important event—"specials," not syndicate reports. What lessons can be drawn from them?

Write the history of some event that occurred in your family or neighborhood before you were born. How do you know when you have the truth of the matter?

As we approach the study of history, one of the most necessary precautions is that we assume toward it the scientific attitude. If the past were a museum into which we could enter and see how things actually *were*, we should hardly dare to take such liberties with it as we sometimes do.

Instead of open-mindedly facing the past, resolved to accept whatever shall be revealed regardless of consequences, we are too inclined to form a mold of preconceptions and force the facts to fit it. To the religionist, history often becomes the story of God's unfolding plan of the ages; to the moralist, it may be a collection of ethical object lessons; to the statesman, a textbook of patriotism; to the man of letters, a mere branch of literature. We should assume none of these things, not even progress, or a purposive plan of occurrence. History is simply the science of what came to pass, especially as affecting human beings.

History as a science.—If we can agree that history is the science of the past, how does it differ from other sciences? Not in its fundamental purpose, for that is the same in all sciences, to understand the world that we may cope with it successfully. It is distinguished by its subject matter, and

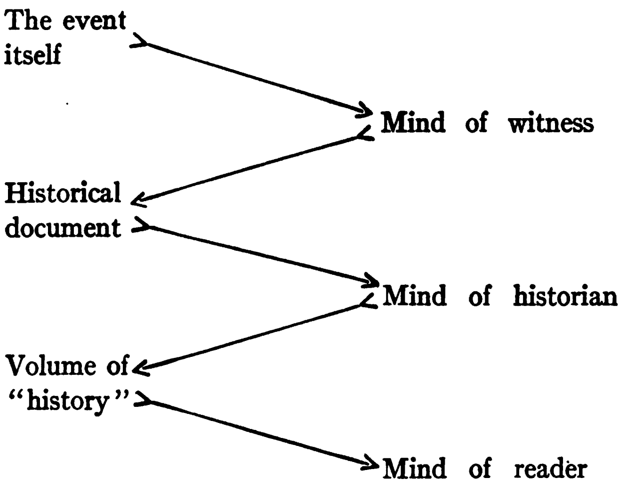
by the departures from scientific method which this peculiar subject matter makes necessary.

Its subject matter is that which no longer exists. The human race is like a traveler whose light can but half penetrate the mist both before and behind him. Both the future and the past belong to that kind of knowledge which must be reasoned out but cannot now be observed,—and the past has slipped away from our observation forever.

It is just here that history fails from a scientific standpoint. For whereas a science like physics can observe its facts directly, record them, and proceed to explain them, history can observe its facts, the happenings of bygone days, indirectly only; must *reconstruct* them by imagination and thought before it can draw inferences from them. This process may be as truthful or as faulty as the zoölogical restoration of an extinct animal.

The reconstruction of the past.—An event occurs, a battle, a death, a change of custom. This event impresses its witnesses, observers, or participants, in certain ways. They describe it truthfully or untruthfully; if truthfully, they employ such words as seem to them fit to convey their meaning. The historian, prejudiced or unprejudiced, reads these words, perhaps centuries later, gives them what meaning he can in terms of his modern experience, tries to rebuild in his own mind the mental picture that was in the mind of the witness, and from this infers what the event itself must have been like. The historian then rephrases the story for us, and we build our own mental picture, trusting that the facts, after these two objective recordings and three subjective reproductions, may, if possible, remain undistorted!

A diagram will make this plain.



We cannot discuss here the additional circumstances that sometimes make the transmission of facts more trustworthy, such as the agreement of independent lines of evidence, nor those that are unfavorable, such as the fact that most witnesses have trusted their memories, instead of recording the events immediately, as scientific practice would require. But the general process of transmitting historical evidence is substantially as described.

Historical science and other sciences.—Having gathered, in this indirect and partially trustworthy fashion, what it believes to be the facts, history deals with them in the usual scientific way, classifying, generalizing, explaining in terms of cause and effect. Love of gain, of religious freedom, or what not, caused our early colonists to brave the dangers of the deep. The principle of union versus secession caused our Civil War. History, then, is no mere record of past

events; like other sciences it consists of facts systematized according to laws and principles.

However, this discovery of laws has not proceeded far in history. The tests of scientific knowledge are prediction and control: *what historian can predict the future, or gain control over the trend of events?*

Moreover, all the past must be explained in terms of the present; history cannot give as the cause of a fact anything which the other sciences do not now recognize as a cause. For instance, no sane historian explains peculiar conduct as due to a devil; the scientific term is epilepsy, psychasthenia, or the like.

From all this it follows that history must always be subordinate to the sciences that deal with present-day experience. "The indirect method of history is always inferior to the direct methods of the sciences of observation. If its results do not harmonize with theirs, it is history which must give way; historical science, with its imperfect means of information, cannot claim to check, contradict, or correct the results of other sciences, but must rather use their results to correct its own. . . . It is kept at a distance from reality by its indirect means of information, and must accept the laws that are established by those sciences which come into immediate contact with reality.*

Social value of history.—If we wish to understand the value of history to the world at large, let us imagine that all historical knowledge has perished. The world would be like one who suddenly loses all memory of his past, having no adequate conception of the present situation and its

* Langlois and Seignobos, *Introduction to the Study of History*, pp. 207, 208. Used by permission of Henry Holt and Company, publishers.

meaning. All the great problems on which history has thrown light—war, slavery, democracy—would have to be worked out again from the beginning.

And history is not only the social memory, but also a means of social introspection, self-examination, self-revelation. As each of us, by an examination of his heredity and his past, can find much in his ancestry, his words, thoughts, behavior, likes, dislikes, and half-born ideals, to indicate the kind of person he is and the course he should pursue, so can a nation, by studying its history, learn of its deeper nature, what its heart forces and ideals are, and of its best possible future. By comparing ourselves with other nations we learn our peculiar genius, our world mission, and the resources we have for achieving it,—minerals, lands, forests, human stock. We learn also of the necessity for conserving all these things. In a word, history increases our national and social consciousness.

It is frequently stated that history inculcates goodness, and especially patriotism. In itself, as the science of the past, it of course has no bias in any direction. Its generalizations favor some things commonly called bad, as well as what we commonly call good. They may even support what is commonly regarded as unpatriotic. The villain and traitor of one party or country may be the first hero of another. In studying history, then, we should keep our minds open, just as we do when we study geometry, botany, or physics. We should try to find out what, in the long run, goodness, patriotism, etc., really *are;* what kind of people we are, and what we should attempt to do in the world.

But history cannot thus reveal our character and destiny, unless a knowledge of it is spread among our youth.

Educational value of history.—Here again we must guard

against supposing that our subject develops any general "mental powers." It is commonly stated that history develops memory, imagination, practical judgment, love of truth. It does tend to educate memory for history, historical imagination, historical judgment, love of historical accuracy. And these very abilities find large use in estimating political arguments, in the franchise, in all important social, political, and civil relations.

That which we wish all children to gain from history is an introduction to citizenship in the large sense. Not that we should strain the facts to support our preformed ideas of citizenship, but let these facts, in the minds of the pupils, pronounce their own judgment on present-day problems. That which we aim to predict and control, so far as may be, is the social situation. We want our young to understand the origin and development of this social situation, and to react upon it intelligently. Just as geography shows us the earth as the home of man, so history should tell the story of man's struggle to make a home on earth. How man obtained food and shelter, learned to write, read, speak various languages; his inventions, thoughts, morals, ceremonies; his industries, ways of tilling the soil, of manufacturing, of transporting, bartering, buying, and of securing coöperation in business; family life, education, division into classes; war, peace, government; art and science, especially as they have ministered to the larger human needs—these are the lines of interest which should guide us into intelligent world citizenship.

The psychology of history teaching.—No matter what we find it desirable to teach, we are always limited and compelled by the ability of the learner. Unless the matter is fitted to the powers of the child our labor is in vain. We

do not teach the history of philosophy in the primary school.

The past includes the most complex events, and the deepest thoughts of man. To picture it, to reconstruct it for one's self, demands such a wealth of images and such power of imagination and thought as no one can possess without wide experience and maturity of mind. Inability to follow a difficult text often leads to discouragement, verbal memorizing, or even complete misconception. Ex-President Roosevelt, when a boy, imagined the "zeal" in "The zeal of thine house hath eaten me up," as a destructive animal, kept careful watch for it, and inquired about it when he went to church. A little miss who spoke glibly in recitation of "general dissatisfaction in the North," explained, when questioned, that "General Dissatisfaction was a Southern general!"

The boy may have to interpret primitive life in terms of camping out; court life he appreciates by means of the parties he has attended; Congress is like his literary society, except that the program is all debates; and war may be the mixture of killing pigs and the death of a playmate. Even pictures can mean nothing unless the observer brings to them sufficient experience to compass their interpretation. Evidently we must be careful to teach that only which the experience of our pupils has made it possible for them to apperceive.

Subject matter.—Because the child's interests and apperceptive powers enlarge gradually, the extreme proposal has been made of beginning with local, present-day facts, and proceeding backward, in the reverse of the usual time order, to the beginnings of all things. Each object or event would find its explanation in what preceded. This would

be the opposite of the order of all experience and nearly all story-telling. The ratchets on the child's apperceptive machinery work the other way.

But to pull the child out of his modern settings and thrust him precipitately back to the beginnings of history is a worse extreme. We must compromise; if we think of the successive periods of history as so many stages in a journey, then it would seem wise to let the pupil proceed from the beginning of the first brief stage, the one nearest the present, down to his own day, retreating thereafter to the most ancient mile posts of successively more distant and longer periods, to repeat the home-coming process. Thus the young historian, as soon as the serious study of events in chronological order begins, might commence with his own history and that of his ancestors, passing from the study of his community to that of his state, his nation, the foreign nation most directly precedent of his own in time—England, for us—and finally the world.

But previous to the serious study of events in chronological order, mentioned above, which might begin at the age of twelve, in the sixth or seventh grade, much historical work of value can be done. The great questions in history are *Who* and *What?* *When* and *Where?* *Why* (or Whence) and *Whither?* The first two, Who and What, call for a personal story, but it may be detached from space and time, unlocated, perhaps not very well ordered, a sort of *sensation* knowledge. When and Where require the space map and the time map, a simple ordering of events as one would have *perceived* them had he been there. Why and Whither demand cause and consequence, relations that are *thought*. We thus have roughly indicated three stages of study, corresponding to the development of the learner.

Of course, our history should nowhere be a mere skeleton of dates or a distemper of wars. Skeletons are necessary, but they are not flesh and blood. Distempers seem unavoidable, but they are not health.

Nor is history simply the story of politics and government. If we are right in regarding history as essentially an account of man's attempts to make a place for himself on the earth, and to manage satisfactorily the affairs on which his happiness depends, then it should picture for us such things as country and climate; attempts at agriculture, mining, manufacturing, and commerce; the development of sciences, arts, languages, music; the beginnings of property holding, marriage, and family life; the growth of morality, religion, philosophy, education; and especially the relations of nations, races, and states to each other. *

Method.—1. In the Who-and-What stage, the primary period, the history *story* is paramount, especially the biographic story; and among biographic stories, those of children are sure to be of interest to children. The location of the events is of no great importance, nor need the character presented be pictured as the type, or representative, of any time or people. The best way to find the most interesting stories is by actual trial with the group to be taught. Pictures are always valuable, and dramatization is always in order. When the child has learned to read, he has unlimited access to such material.

2. In the When-and-Where stage, which roughly speaking is the grammar-school period, it is advisable to use textbooks on the spiral plan, covering the history of our country, for instance, at least twice; first briefly, touching

* An excellent outline of the subject matter of history is found in the work of Langlois and Seignobos (see References), p. 234.

the larger events only, then in fuller detail, taking care to avoid the death valley of verbal memorizing and repetition. But as no school history can be complete, it is necessary to make use of *type studies*, one carefully studied colony being used to interpret a similar group, one detailed battle standing as representative of a war, etc.

The *time* map and the *space* map become important. The first may be so arranged as to place each event in its proper decade or century, and at the same time, by means of parallel columns, exhibit contemporaneous events in different countries. The space map should be simple, often drawn by the pupil. He should not see on his map the cities, boundaries, and roads of modern times, unless he is studying modern history.

New work should often appear in the form of a problem, to solve which the pupil is referred to historical sources if they are available. But the use of sources at this time is like the experiments in elementary science, providing illustration rather than proof.

3. The Why-and-Whither period, the high school and college stage, may well be characterized by the increased study of sources and the full development of the critical sense in the use of them.

Civics.—In a democratic country, where every man has a fraction of the ruling power, he should know how the ruling is done. Civics and history must be so clearly correlated as to form practically one branch. Civics in its development is an actual part of history.

Here we can get at the sources with a vengeance, for all can visit town council or school board meetings, and many can take the trip to state or national capital.

Participation in such activities as will help to interpret

history and civics are extremely valuable. Perhaps this is the chief service of the moot trial, the mock congress, and the school town or city.

FOR FURTHER STUDY

1. List the dates which you think a child should memorize in studying United States history. How can a single date be made to stand for many events?

2. If an author in writing a history cannot give *all* the known facts, what principles should guide him in selecting the facts to be presented? How do you think the newspaper man solves this problem in reporting?

3. "Class politics in school or college enables one to understand the larger political movements outside." Discuss this statement.

4. Have you ever pictured some distant place to yourself, and afterwards found your ideas of it to be incorrect? How can we be sure that our mental picture of the past is correct?

5. What value can you see in having pupils compare various ages, countries, customs, etc.?

6. According to the Binet tests, a child should detect nonsense or inner contradiction in a story at the age of eleven. Does this have any bearing on the method of teaching history at that age?

7. I propose to teach the usual facts of general history to a beginning class, age seven or eight, by using words of one syllable. State your psychological objections.

8. Show why "battle history," that is, the history of wars chiefly, is to be condemned.

9. You have some pupils who do not care for history, but are interested in art, inventions, factories. What should you do? Theoretically, can anyone be totally uninterested in history?

10. Select any historical event, as the discovery of

America, and answer concerning it the questions, Who? What? When? Where? Why? Whither? Does anything remain to be told?

11. Discuss the value of the magazine picture, post card, stereoscope, stereopticon, and moving picture, in the teaching of history.

12. Do you know of any historical material, spinning wheels, andirons, letters, etc., in your community, that might be collected for a school museum? What would be the value of such a museum?

13. Show the use of historical poems in teaching history.

14. Discuss the correlation of history with drawing; with composition; with geography.

15. Write an essay on "The use of the blackboard in history teaching."

REFERENCES

Barnes, Mary Sheldon, *Studies in Historical Method.*

Bourne, Henry E., *Teaching of History and Civics.*

Dewey, John, *The School and the Child*, Ch. 7.

Gilbert, Charles B., *What Children Study and Why*, Ch. XXIII, XXIV.

Gordy, J. P., *A Broader Elementary Education*, Ch. XXII.

Hinsdale, B. A., *How to Study and Teach History.*

Langlois, Ch. V., and Seignobos, Ch., *Introduction to the Study of History.* (Translated by G. G. Berry.)

CHAPTER XXIV

ART

"The movement, indeed, represents in some sense a revolt against the hard mechanical conventional life and its insensibility to beauty (quite another thing to ornament). It is a protest against that so-called industrial progress which produces shoddy wares, the cheapness of which is paid for by the lives of their producers and the degradation of their users. It is a protest against the turning of men into machines, against artificial distinctions in art, and against making the immediate market value, or possibility of profit, the chief test of artistic merit. It also advances the claim of all and each to the common possession of beauty in things common and familiar, and would awaken the sense of this beauty, deadened and depressed as it now too often is, either on the one hand by luxurious superfluities, or on the other by the absence of the commonest necessities and the gnawing anxiety for the means of livelihood; not to speak of the everyday uglinesses to which we have accustomed our eyes, confused by the flood of false taste, or darkened by the hurried life of modern towns in which huge aggregations of humanity exist, equally removed from both art and nature and their kindly and refining influences.

"It asserts, moreover, the value of the practice of handicraft as a good training for the faculties, and as a most valuable counteraction to that overstraining of purely mental effort under the fierce competitive conditions of the day; apart from the very wholesome and real pleasure in the fashioning of a thing with claims to art and beauty, the struggle with and triumph over the stubborn technical necessities which refuse to be gainsaid. And, finally, thus claiming for man this primitive and common delight in common things made beautiful, it makes, through art, the great socializer for a common and kindred life, for sympathetic and helpful fellowship, and demands conditions under which your artist and craftsman shall be free." *

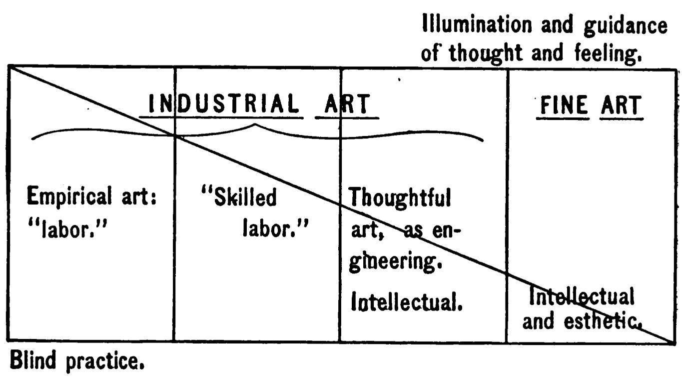
* Walter Crane, "Of the Revival of Design and Handicraft," in *Arts and Crafts Essays*. Used by permission of Longmans, Green and Company, publishers.

Exercise.—Go to the shop and make some article. If possible, coöperate with several in a group project. Write an introspective account of your experience, and of the effect of the work on you.

In the preceding three chapters we have dealt with science in general, and with two special kinds of science, mathematics and history. "A science teaches us to know and an art to do." We now approach that part of the program of studies which demands *doing*.

The nature of art.—Art is essentially a process by which raw material is changed into a finished product; and *skill*, the original meaning of art, emphasizes the fact that the process is under human control. Such processes range all the way from the primitive chipping of a flint to the deft stroke of the modern master.

The general relationship of the arts to each other can be shown by a diagram similar to that used in classifying the sciences.



Art is the hand of man, as science is his head. Science is man thinking; art is man doing. In the empirical stage, the

hand acquires a certain cunning by a long process of trial and error, low-level learning. But this is confined mainly to skill in isolated acts, the shaping of the iron, the guiding of the saw.

It requires directing intelligence to lay down the line for the saw. The engineer, with his high-level mentality, must not only work with scientific accuracy, but he must dream out the things to be, and have visions akin to those of the fine artist.

There is no sharp boundary line between industrial arts, such as engineering, manufacturing, wood carving, and the fine arts, sculpture, architecture, painting, poetry, and music. But fine art gives free wing to imagination and emotion, and is not so much concerned with the mere making of a living as it is with the living of an ideal life.

The social value of art.—To say that this is an age of industrialism is to call it an age of art. The industrial artist stands between us and the stern demands of uncompromising nature. His engines lay hold of the crude rock, and ore, and timber, and soil, and turn out for us our houses, clothing, food, means of travel. Were it not for him and his contrivances, we should all have to enter into a face-to-face conflict with our formidable environment, and fight the fight of primitive man once more.

We ought not to fear industrialism, business, the factory. We should be as thankful for all great industrial or business engineers as we are for the chief engineer of the Panama Canal. Because of the greatness of it all, there is also great danger,—danger of injustice, of industrial oppression, of losing sight of the individual workman and regarding him as a part of the machinery. But education should be glad of the chance to help establish equal rights in industry, as

it is already helping to establish equal rights in politics and in government.

The chief value of fine art, so far as the multitude of us are concerned, probably consists in expressing the great truths of life, its highest thoughts and deepest emotions, in such striking material forms that they beat in upon our *senses* from the *external* world; making it possible for us to assimilate much truth and beauty which, left to our own limited brain processes, we should never have spanned.

Educational value of the arts.—A certain limited number of arts, commonly called the school arts—reading, writing, spelling, and speaking the mother tongue, together with the art of computation—must ever form an important part of early education. Their purpose and value are clear; they are the instrumental arts, necessary to further education and indispensable in practically all vocations.

The industrial arts seem to have (1) an intellectual value, (2) a moral-social value, and (3) a vocational value.

(1) As we well know, the brain cells cannot wake without external stimulus, and one of the best forms of stimuli is undoubtedly muscular activity. The hands will not work long before they call upon the head to direct them, *think* for them. In the old-fashioned school there was too much of the throwing-in process, too much impression, too little expression. While we measure men by their productivity, their *output*, what they can actually do, we have been grading children by what they could *take in*. It has been shown that development is really quickened by devoting a part of the school time to expressive art; making an object insures better knowledge of it. In addition, an apperceptive basis is acquired for intelligent appreciation of the arts and industries of the world.

(2) Perhaps the contribution of craftsmanship to ethical culture is commonly overstated. Sawing a board off "square" need not beget love for the "square deal." But if the nations that are skilled in arts and crafts are most highly moral, as they are said to be, and if, as statistics show, comparatively few state's prisoners have ever learned a trade, handwork and moral behavior may have some vital relation.

There is little doubt that touching elbows at the work-bench engenders a fellow feeling which makes against cleavage into antagonistic social strata, when school days are over. The school is partly an effect, but very largely a cause, of the social life that surrounds it. Whatever is wanting to-day in the educational ideal will be missed to-morrow in the social and civic ideals of the people. If labor is to be respected in society, it must be respected in the school. If capital and labor are ever to join hands for the common good, they should become fast friends before their school days are over. To respect labor one must understand it; to understand it he himself must work. Thus does one acquire sympathy with the whole great, struggling, misunderstood industrial world. The future employer may well learn the workman's viewpoint by being a workman; and the laborer feels drawn to such an employer.

(3) One great difficulty with our schools is that we have been so intent on securing in them the flower of civilization that we have neglected the root. We have been so intent on culture that we have forgotten vocation. The child should learn from his experience in school that earth is the great producer and that industry is the great transformer; he must not be allowed to regard the school as an avenue to wealth without work.

There is a foolish fear abroad that culture may be passed by in the quick march for vocation, the old idea being that we must proceed through culture to vocation. The new education sees that in the majority of cases we must find culture *through* vocation or never find it at all. There is also frequent warning that the man must not be submerged beneath his work. It is exactly in the prevention of this catastrophe that the tendency toward industrial training finds its highest vindication. The submerged man develops typically from a boy who, tired out with the graces of culture, leaves school early and goes to work without training.

We must consider the submerged woman also. Ninety per cent of our girls become home makers, and it is not pessimistic, but truthful, to say that many of them are leading lives of undue gayety before marriage which result in undue anxiety after marriage; having been carefully shielded from all "kitchen work," they discover, with pain, that parlor adornments will not suffice. Industrial art, especially domestic art, not only enables our girls to appreciate much in history and in present social conditions, but prevents the somber disenchantment and distress which housekeeping brings to the uninitiated, insures neat clothing for the household and a button for every buttonhole, augurs good meals, good digestion, good health. Industrial art provides the material basis for an ideal home.

Of course, not all men will find their vocation in industry nor all women in home making. But that legions would be thus benefited by the industrial arts we cannot doubt.*

* The fine arts, too, have (1) an intellectual-emotional value, in their expression of great thoughts and feelings in simple forms that appeal to the senses, and in their development of artistic critical power and an appreciation of pure beauty; (2) a moral-social power, as exemplified in folk and national songs, and in the community feeling

Subject matter.—In determining which of the industrial arts we shall teach, and to what extent, two extremes must be avoided: (1) that of making all children practice all arts, and (2) that of permitting no child to acquire any industrial art as a part of his regular education.

(1) No educational blunder is more common, or more productive of harm, than the assumption that all children are born similar and equal, or at least, that all should have the same training. It seems to be quite commonly assumed that if we provide work in clay, leather, brass, wood, and iron for the grammar school, all grammar school pupils must become proficient in all the work provided. We cannot too often reflect that *diagnosis should precede prescription:* our first duty, when a child comes to us for an education, is not to take him for granted and proceed with the education, but to find out *what kind of child he is*. The child who shows a strong liking for the mechanic arts, with little ability for anything else, may well spend the major part of his time trying himself out on various kinds of materials, processes, and machines.

On the other hand the brain-blest boy, who needs little external stimulus to set his subjective machinery to work, may safely devote himself to the running of his mental mechanism, and spend a comparatively small amount of time on any other.

The school must be as broad in its work as is the world it serves, providing a multitude of activities for a multitude of talents. This is costly, but it means human efficiency and attainment, and nothing is costly when weighed against that.

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engendered by choral singing; (3) a vocational value. The latter is important, for although few devote themselves permanently to the fine arts, the influence of these devotees on the lives of the more numerous common people is often tremendous.

(2) The second extreme consists in sharply separating all industrial education from the established general, liberal or cultural education. In such a case, if the boy needs most an education in mechanics, he must leave school, so to speak, to get it. It is futile to postpone this for years in the hope of compelling him to absorb culture first; he will end by getting neither. The boy may sometimes go to the machine in the shop instead of having the machine brought to him in the school, but there must be one unified school system, large enough to include various kinds of industrial training as a part of the regular education of those who can most profit by it, and offered, not necessarily at any one time for all, but open to each individual just when he personally can derive the greatest benefit from it.

Art, skillful doing of some kind, according to the nature of the pupil, should find a place from the very beginning of school life. But it may have to be as indefinite in our curriculums as nature study and elementary science are. We may lay it down as a general principle that every study should have its art side, its active phase, for the sake of expression and interpretation. In story study we have dramatization; in geography, mapping and modeling; in history, the reproduction of primitive implements and industries. Music, drawing, and manual training can be correlated with every sort of undertaking. But the *vocational* trend of each pupil, the line of greatest interest and ability, whether in agriculture, or working in wood or iron, should determine which art shall be pursued seriously and at length for its own sake.

Method.—As we cannot consider the numerous arts individually here, it must suffice to call attention to the laws of learning, previously laid down.

We must first of all make clear our aim, determine just what is the act to be learned, and whether it shall be rendered fully automatic, or habitual, or simply be made more definite and understandable by centering attention upon it for a time. But we must consider the *learner* also, as well as the process to be learned, and decide whether he can profit most by low-, mid-, or high-level learning. We must all, to some extent, learn to do by doing; but the future engineer must also be able to learn to do by *learning how to do*,—must be able to learn from the brain down as well as from the hand up.

The best motive is natural interest, at first what might almost be called a vocational instinct, perhaps dimly felt, later becoming more and more consciously a life-career motive. But as sensible teachers we must be content with and appeal to a motive such as the learner can appreciate, be it play with the finished toy at the end of the hour, or the "job" at the end of the year, or a joyous life based on the ability to render artistic service.

If then we make clear to the learner just what he is to do;—especially by doing it ourselves; if we help him to keep himself in good condition of nerve and muscle, and applied to his task; if we support his self-confidence and interest by cheering him over the plateaus of slow and grinding progress, we fix the essential conditions of successful method. The technique must depend on the nature of the particular undertaking; but sympathy, imitation, and suggestion are of strong value in teaching technique of whatever kind.*

* With regard to the fine arts, experimental pedagogy contributes some interesting facts: that the younger the child, the less stable is he in his emotional life, and the more suggestible; that girls have the higher appreciation for color, boys for form; that the younger the child the less critically he judges a picture as a picture, passing at once

FOR FURTHER STUDY

1. Should manual training be continued throughout the usual college course? Why?

2. Name some arts that would fall into each of the divisions given in the classification of the arts.

3. Write on "The place of pictures in my education," giving your earliest memories of pictures, etc., and estimating their influence on your development.

4. Do you think the old-fashioned school, in which labor found little place, had anything to do with the many present conflicts between labor and capital?

5. If one has to miss either culture (liberal education) or vocation, which should he make sure of?

6. Give some reasons why the mistress in the parlor and the maid in the kitchen have so many misunderstandings and disagreements.

7. Criticize these statements: "We must not teach trades to young boys, for they are not old enough to choose their life work." "The boy who can learn a trade in the grammar school will never seek the liberal culture of the high school." "There is no room for industrial arts: our programs of study are already overloaded."

8. Should "the boy" be kept on the farm? Or should *some* boys (who by nature take to farming) stay on the farm, while others leave it to pursue their vocations elsewhere? Should agriculture be taught in rural schools with the express purpose of keeping boys on the farm?

9. Should we allow anyone to learn a trade without taking a large amount of cultural work in connection with it? Should we permit a terrier to chase rats before he has

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to its meaning; that young children (up to about eight years) tend to omit the decorative and include the utilitarian in their drawing; and that discrimination of melody and rhythm, and emotional appreciation of both, develop markedly at about the age of nine, rhythm being the more highly appreciated and better remembered. (See Robert R. Rusk's *Introduction to Experimental Education*, Ch. IX.)

learned, like the St. Bernard, to rescue lost travelers? Should we permit a cobbler to mend our shoes before we have tested him on writing sonnets?

10. Work out in detail some possible correlations of manual training with other branches of study.

REFERENCES

Carlton, Frank Tracy, *Education and Industrial Evolution.*

Dopp, Katharine Elizabeth, *The Place of Industries in Elementary Education.*

Griggs, Edward Howard, *The Philosophy of Art.*

Ham, Charles H., *Mind and Hand.*

Hanus, Paul H., *Beginnings in Industrial Education.*

O'Shea, M. V., *Every-day Problems in Teaching*, Chs. VI, VII.

Ware, Fabian, *Educational Foundations of Trade and Industry.*

Arts and Crafts Essays, by Members of the Arts and Crafts Society.

CHAPTER XXV

LANGUAGE

"Never, until the idea that composition is a 'study' to be learned from a book is banished from the school, will children be taught to write properly. Among the severest criticisms made upon the common school are these: 'The reading and spelling are poor,' 'The mechanical work in arithmetic is laborious and inaccurate,' 'The composition is bad'; and these are faults that can be corrected only through practice. There can be no greater mistake in relation to the first stages of school education than that the *rationale* of a process is immediately valuable. A painter or musician knows his technical rules and his science, but neither his technical rules nor his science can take the place of technique or execution. It is by no means always true that a mathematician is 'good in figures'; on the other hand, he is often poor. It is, therefore, extremely important that the teacher should clearly see whether the end to which a school exercise looks is skill or knowledge—practical power or intellectual power." *

EXERCISE.—A teacher attempts to teach some boys to skate; and also to use their mother tongue well. On the ice, they proceed at once to copious practice under coaching, but without rules, and soon become proficient; in the schoolroom, they first have many language rules and grammatical principles, followed by scanty practice and mediocre success. Comment on the situation, comparing (a) the previous experience of the pupils, (b) the nature of the task and the boys' probable interest in it, and (c) the method used. Could the subject matter of language be made as interesting as skating? Would the same subject matter be equally interesting to all pupils? What can be done about it?

* B. A. Hinsdale, *Teaching the Language Arts*. Used by permission of D. Appleton and Company, publishers.

Nature of language.—We have discussed science and art, with special attention to two kinds of science, mathematics and history. There remains an art which, because it serves all and must be taught to all, deserves separate treatment: it is the *art of language.*

Of course there is a *science* of language—it has several sciences, of which grammar is a well-known example. But grammar did not make language: the language came first, the grammar afterward; the art leading, the science following. And so should it be in the teaching of language.

Social value.—Let language perish, and we should either re-invent it or herd with the brutes. Printing has well been called the art preservative of all other arts. Language in the broad sense, communication of some kind, is certainly an indispensable tool in all our progress.

Words are also an aid to thinking, and hence to progress. Thinking without words is about such an undertaking as difficult mathematics would be for most of us without pencil and paper, or even a stick and a sand plot. A word is a kind of signpost which marks a place on our mental map. *

Finally, a large part of the social value of language consists in making us social. All that we are or can hope to be, we owe to the fact that our primitive fathers loved to get together and talk! By such social communication we come to understand each other, sympathize, imitate, emulate, become socially efficient. We can see this in the classroom, clubroom, literary society, even in the street. Nations, too, can understand each other better when each learns the other's language.

* How much experience can be compressed into a single word, we can see from the dictionary and from such books as Trench's *Study of Words.*

Language as educational material.—Language has the same value in school that it has outside. (1) It enables us to get and to give ideas, (2) it is a good tool for the thinker, and (3) its practice, since it always involves at least two persons, is essentially a social practice.

But we must never forget that words cannot take the place of things.* They are like paper money, of no value except as they stand for something beyond themselves. The younger the child the more necessary it is that perceptive experience of objects shall precede the word used to name that experience. The birth (of the experience) must precede the christening.

Nor can words take the place of ideas. We cannot give a man big thoughts by teaching him big words, nor make him wise by teaching him many languages. As a great language never made a great nation, but great nations have felt the need of and made great languages, so language will not form a great soul, but a great soul requires high linguistic power to express itself. To think that language makes the man is about as incorrect as to think that clothes make the man.

Language, then, is an instrument. Its use is an art. One who has learned it is like one who has learned to strike all the typewriter keys; he may or may not have ideas to express.

To make language the core of all curriculums, as we are often urged to do, would be, for many children, like substituting the reflection for the real object. Each child's curriculum must have its own vocational core, about which all else is organized. But we must remember in every case that some language is necessary, whatever the vocation.

* See page 69.

Subject matter.—In order to make use of language, we must be able (1) to tell what words mean, and (2) to use words to tell what we mean. In the first case we are either reading or listening to words; in the second, we are speaking or writing words. To know language then, one must know "words, words, words," and how words go together.

First and foremost a child must learn to listen and to talk. Talking is learned largely by listening, partly by practice. Unfortunately, in many cases the children are turned over to us with bad language habits already formed by home and street. But at any rate the teacher's work begins with the babble of the first days at school. We must arrange such rousing experiences as will spontaneously let loose a medley of tongues, and we must bestow high praise on such primitive elocution as we can challenge forth. To check the children with too much correctness at this stage may mean permanent discouragement. And as the world talks more than it writes, so must our language work, from first to last, be mainly oral. We teachers are too much afraid of having a social good time with our pupils.

It is difficult to talk while listening to some one else; yet this is what the pupil must do when he reads, except that he listens with his eyes, so to speak. That is, he must at the same time *perceive* words and *pronounce* words, and the eye must run ahead of the tongue, the perceiving ahead of the pronouncing. He must learn to gather words by the eye-full, almost automatically, so that he can fix his mind on expression.

To some extent, this kind of double process runs through all language work. In conversation, one must listen and at the same time think of a reply. In writing, one's thoughts should speed on in advance of pen or typewriter. In public

speaking, one must learn how to pronounce a phrase or sentence while sending the mind on to prepare the next for utterance.

It is plain that in forming these difficult, double habits, the essential is *practice*. There is no secret short cut; here we learn to do by doing.

We can now fix the place of English grammar. It has about the same value as a difficult *Manual of Skating* would have for the boy on the ice pond, or a prosy and pictureless manual of swimming for the one in the water. Such high-level learning is out of place with young pupils. It should be introduced whenever the pupil develops high-level language ability and shows an interest in the subject. For some children this may be in the grammar school; for others, in the high school; for still others, never. Where all pupils are required to take it at an early age, most of them should be allowed to pass it with very moderate attainments.

Literature.—One essential thing to learn here is that literature cannot take the place of life. We are in danger of supposing, when we have taught the child to read, that all life and experience are now open to him. But the joys and sorrows of humanity mean nothing before one has had joys and sorrows of his own. We must interpret literature through life before we can interpret life through literature.

Lessons in literature (when one has gained experience enough to interpret them) are chiefly *appreciation* lessons. They convey some information, arouse some thought, and encourage skill in expression; but their highest value lies in the fact that they are verbal moving-picture shows. If the author knows life, his pictures are true to life; they teach us what happens, in the long run, to the fool, the knave,

the proud, the wise, the righteous. They show us how marriage and other adventures turn out. They help us to appreciate life situations, and to decide which is to be our character, and how we shall play our part.

Our children need literature in abundance,—such literature as they can appreciate. It is fortunate if the pupil can be permitted to follow his own choice, to show us, by his literary taste, and by his choice of selections to memorize, what kind of soul he has. If the children are brought into contact with such literature as answers to their individual brain-set, if it is the literature itself and not a mere study *about* literature, and if they are given such aid as they need to interpret the difficult portions, we have satisfied the essential conditions.

Method.—If there is anything the discoursing public, young and old, needs to realize, it is that when words are used they should be used *for* something. Woodrow Wilson is to be commended for his college practice of refusing to take part in a debate unless he could argue with conviction. His aim was not merely to appear before an audience, but to convince. Our schools need less of the perfunctory practice of language, and more of the sincere and purposeful effort which grows naturally from life itself. Help the pupil to make clear his purpose then, whether to "tell something" or "make one feel" so and so, or "get one to do" thus and so.

Our next great dictum, perhaps first in importance, is to *keep life ahead of language.* Our stilted (and borrowed) compositions, declamations beyond the comprehension of the declaimer, and school readers whose literature is years beyond the range of the pupil are conspicuous examples of our failure at this point. Out of the abundance of the heart

the mouth should speak, and not alone from the pages of an encyclopedia, or from a brain which has been mechanically impressed into service as sort of phonograph record. Where-ever there is a real spring, it will find its way out. Where-ever there is abundant life, the teacher could not suppress it if she would: the chief need is for direction and control. This wealth of personal thought and feeling is just as necessary for reading and interpretation as for composition and public speaking.

Granted the presence of something to say or to be read, and a clear conception of its nature and purpose, what more is necessary? The essentials seem to be: (1) repeated contact with appropriate models; (2) imitation of such models; (3) comparison, criticism, and repeated effort; (4) the gradual acquisition of the power and habit of self-criticism.

(1) The poet needs to read many poems of the kind he writes; the orator should read and listen to many orations. As the teacher is "the way" by which the child comes into contact with the world, she must procure these models. Woe to the pupils if their teacher has never really learned to read and write! She must rely on visitors, on literature, on the phonograph,—the better kind,—and on the best artists among her pupils.

(2) Franklin, by his method of learning to read and write good English, has taught us the value of imitation. One may not only be ignorant of the science of his art: he may not even know its verbal rules. A four-year-old brought up in an environment of good language often speaks better English than a college graduate whose youthful tongue imitated bad models. In the early stages of the art, at least, we should acquire skill in language as we acquire skill in a game or sport.

(3) Imitation usually means mid-level learning; "comparison" and "criticism" of a very useful but not highly analytic kind may occur on the same level. The child can usually be made to *feel* where his fault is, even when he is unable to discern clearly just what is the matter. But it is essential to learn in some way which side of the mark the stray bullets are going, if we are ever to learn to shoot straight.

(4) Self-criticism is ~~likely to involve an intellectual~~, analytical, high-level activity. We should encourage it wherever we find capacity for it, and lead up to some knowledge of the *science* of language. Here we enter the expert stage.

FOR FURTHER STUDY

1. Look up, in Franklin's *Autobiography*, his method of learning to use good English, and outline the essential steps.

2. Make a list of the chief acts of skill which you have acquired. What has been the general process?

3. We often quote the dictionary as authority: what authority lies back of the dictionary? What is the ultimate source of authority in the use of language?

4. Name some of the advantages that would follow if we could have but one letter for each sound and one sound for each letter. Is such an ideal worth working for?

5. Some teachers of foreign language compel their pupils to perform each act, so far as possible, while saying the words descriptive of it. Comment on the practice. Should you use this method in teaching the mother tongue? Why?

6. Discuss the topic, "Kindergarten versus home, as an aid to the use of correct English."

7. A lecture on "The nature of our number system" is delivered in flowery style, ornamented with poetic quota-

tions, and graced with dramatic climax and sweeping gestures: just what, if anything, is wrong?

8. Watch yourself carefully for a time and find how often you catch yourself imitating another's language. When you hear a striking phrase, are you likely to let it die, or try its effect soon on some one else?

9. Try to account psychologically for the spread and popularity of slang.

10. If we all "know better" than to use poor English, having studied grammar, why do we not always *do* better?

11. Write an introspective account of "How I learned to read." Mention any improvements which you think could have been made on the method.

12. Can you speak or read readily any foreign language you have learned? Comment on this.

13. Show points of similarity between your learning to read a foreign language, and a child's learning to read English. What help does the memory of your own difficulties give you in understanding those of the child?

REFERENCES

Carpenter, Baker and Scott, *Teaching of English.*

Chubb, Percival, *Teaching of English.*

Hinsdale, B. A., *Teaching the Language Arts.*

La Rue, Daniel Wolford, "Philosophy of the Elementary Language Course," *Education*, Vol. XXX, pp. 74–83.

O'Shea, M. V., *Every-day Problems in Teaching*, Ch. VIII.

Palmer, George Herbert, *Self-cultivation in English.*

Rusk, Robert R., *Introduction to Experimental Education*, Chs. XIV–XVI.

Tompkins, Arnold, *Science of Discourse.*

PART FIVE

EDUCATIONAL PRACTICE AS INFLUENCED BY THE EDUCATIONAL IDEAL

CHAPTER XXVI

MORAL EDUCATION

"A beautiful form is better than a beautiful face; a beautiful behavior is better than a beautiful form: it gives a higher pleasure than statues or pictures; it is the finest of the fine arts. A man is but a little thing in the midst of the objects of nature, yet by the moral quality radiating from his countenance, he may abolish all considerations of magnitude, and in his manners equal the majesty of the world." *

EXERCISE.—Recall vividly your conduct in the elementary school. What were the chief influences that kept you good? What led you to do your bad deeds?

Do you think there can be a science of human conduct? An art? Why?

We have found (Chapter IV) three kinds of education, physical, moral, and vocational. The first has been treated (Chapter V). In this closing part of our study, we shall consider the remaining two.

Conduct should have a scientific basis.—This much seems certain: we live in a very substantial, orderly world, where facts are facts, and where things happen according to law. If our behavior is not built, from the foundation up, squarely on these facts and laws, then there is something the matter with the behavior. There is no special concealment or special revelation in nature, concerning matters of human conduct; they are just as open and just as hidden

* Ralph Waldo Emerson, *Essay on Manners*. Used by permission of Houghton Mifflin Company, publishers.

as the affairs of psychology, of sociology, of economics, or of any other undertaking that involves human nature. This means that ethics is a possible science. But it is still in a very crude state of development.

If we are right in coupling science and conduct in this way, it will pay us to reflect at this point on the following statements:

1. *Scientific method should be followed in the teaching of morality.* If morality cannot be taught at all, then no method is as good as any method; but if it can, we should have a pedagogy of morality as we have a pedagogy of arithmetic and of manual training. Perhaps we rely too much on moral miracles, too little on the slow, plain, old-fashioned, laborious methods which have proved themselves in other directions by winning for us our greatest triumphs. No get-good-quick method that will answer for all has ever been discovered.

2. *Behavior = organism + stimulus.* We never doubt this when the organism is a plant or a very low animal such as an oyster, perhaps not even in the case of a year-old infant. The baby is not to blame; he "cannot help" getting angry when something hurts him. But the behavior of the child soon becomes so complex that we accuse him of having a "will of his own." Whoever makes such a charge should be compelled to prove it. Human nature, like the world outside, is governed by laws. If we know these laws, if we are thoroughly familiar with the "make-up" of any given individual, we can choose and apply to him just the right stimulus to bring forth any reaction that we desire, and of which he is capable. Solomon knew that the real mother would protest against the severing of her babe.

At first, every strong stimulus starts an impulse that

goes over into action on the spot, as the puppy chases the cat and the baby eats jam, at sight. But experience usually develops inhibitors to stop our reckless impulses; when the puppy has felt the claws of the cat and the baby has made himself sick, both learn self-restraint. But some persons cannot develop such inhibitors. "Such a person may have perfect 'society manners,' but on occasion will take from shops articles for which she has no need; or another is regarded as a valuable member of his community, a leading member of the bar, but about once a year consumes a nearly lethal quantity of alcoholic drinks; or another is an agreeable, generous, affectionate young fellow who, about once a month, secretly sets fire to buildings in order to feed an irresistible love of the excitement produced by the flames." *

3. *The organism is largely determined by heredity.* Here, again, is a truth which we are willing to admit as applicable to plants and lower animals, and which doubtless holds when applied to human beings also.

"Even in numerous elements of mood and behavior the influence of the hereditary make-up is striking. One person is prevailingly elated, jovial, irrepressible; another quiet, depressed, melancholic; another still, alternates in these moods, and when elated he believes he can do anything, but when depressed a sense of helplessness overpowers him. Again, one person is original and independent while another is always imitative. Here is a famous lecturer who has quelled mobs with his eloquence but who is prevailingly diffident; while there is a woman who has lived always in the backwoods and is as forward as a Canada jay. Sincerity or insincerity, generosity or stinginess, gregariousness

* C. B. Davenport. Used by permission of the *Popular Science Monthly.*

or exclusiveness, truthfulness or untruthfulness,—all are qualities whose presence or absence is determined largely by the factor of heredity.*

4. *The organism is highly individuated.* Our natures are as different as our figures and faces. Personality is almost infinitely various; and hence the surest way to be morally unfair is to "treat all just alike." One child needs the stimulus of scolding or whipping and is improved by it; another who commits the "same" offense, does not need such punishment and would be injured by it. Some boys who steal should be placed in a reform school; others should be furnished the breakfast they could not obtain before they left home in the morning.

5. *The organism should be maintained in fit condition.* Ordinary observation shows us that much bad conduct is directly traceable to poor food, bad air, fatigue, lack of sleep, indigestion or other disease. It is quite compatible with the doctrine of heredity that we should behave differently under different physical conditions. The starved and jaded horse may balk; rested and well fed, he may exert himself without remonstrance.

On the other hand, much avoidable badness results from the accumulation of an overplus of nervous energy. The pranks of overfed horses and of the idle rich are illustrative of this. The old prayer holds good of nervous energy as well as of economic wealth: "Give me neither poverty nor riches."

6. *Stimuli must be adapted to individuals.* We load the machine according to the strain it will stand; we should show equally good sense in dealing with fellow creatures. The child with an inheritance of bad temper must not be

* C. B. Davenport. See footnote to previous quotation.

teased. The weakling in arithmetic must be forgiven his weakness and permitted to "pass" if he would be better off, on the whole, in the next grade. The remark which one friend takes graciously offends another deeply; we should act accordingly. It should be to us one of the finest adaptations of moral economy thus to supplement our mutual strengths and weaknesses.

7. *Society should not expect the same maximum of morality from all.* This is evident if the preceding statements are true. There are born fine artists in conduct as there are in music and painting. We cannot hope to make all pupils expert readers, carpenters, or spellers. Much less can we hope to make them all artists in fine living. We must content ourselves in many cases with *passing* morality. "*From* each according to his powers, *to* each according to his needs," is an excellent social-moral precept.

Moreover, this hereditary moral nature and naturally fine conduct should be the first qualification of every teacher. She should be a highly trained and self-disciplined specialist in the intricate technique of right living. We cannot sacrifice this in the teaching craft, not even for the intellect of a genius.

Aim of moral education.—Having reminded ourselves that we must proceed scientifically here as elsewhere, and not depend on miracles in morals any more than we do in physics, and having examined some of the limitations which well-established facts impose upon us, we may now consider more minutely the purpose we may reasonably hope to achieve, preparatory to a choice of methods to accomplish it.

Our general aim is to make people good and to secure the performance of good acts.

What constitutes the good?—An *act* must be judged by its *results;* a *person* by his *intention* in any particular case. If I try to shoot an upright man, but accidentally kill his murderous enemy who was about to strike him down, I am bad, but my act is good.

But even persons must be judged in the long run by the results of their lives. The grinning fool and the shrewd rascal are different, but both "bad," since their presence is a harm to society. Both should be "punished," that is, subjected to stimuli that will call out the best reaction each is capable of. Probably the fool should be kept in gentle restraint until his useless life goes out; the rascal, according to his kind, should be subjected to simple kindness, or an education, or stripes, or imprisonment.

Are we to teach a science or an art?—In teaching our pupils to act with good intention always, and up to the level of their intelligence, are we to teach a science or an art? Both, to advanced pupils; but to the immature, the art only. Shall we use a textbook, commit rules and principles? Certainly nothing more than an ethical storybook for the young; it is almost as useless to teach them morals by catechism and preachment as it would be to teach manual training or writing in that way. *Practice* is the essential. But with those mature students who give promise of being specialists in fine conduct, exhaust the science; there is all too little of it. An elective in high-school ethics is exactly in place. Here, as always, we must choose low-level or mid-level or high-level learning, as best suited to the learner.

Kinds of moral lesson.—We have the same kinds of lesson here as in other subjects, lessons for information, thought, skill, and appreciation. The pupil must have a certain amount of information, "know enough to be good";

but beyond this, cramming facts will no more save him in morals than in music. The thought lesson is of high value when the pupil is ready for it. Morality, in the early life of the child, may stand on mere authority, but it cannot do so permanently. We teach the pupil to ask "Why?" in everything else; we should do so in matters of conduct. Would that we could induce all to take reason, finally, as the guide in life!

The moral appreciation lesson is appropriate at all ages, and serves to fix a brain-set favorable to the moral life; contemplation and participation are the watchwords. But most teaching of morality consists in the inculcation of something like *acts of skill*, that is, habits; for the good life is composed largely of the repeated performances of particular good acts, well drilled in. We teach lessons in morals, then, just as we teach similar lessons in other branches.

Habit-building.—Professor James has made classic the laws of habit formation. They are:

1. Start strongly.
2. Permit no exceptions at first.
3. Use every opportunity for practice.

If we cannot make a clear leap from the old practice to the new habit, we must take as long a step in that direction as we are likely to achieve without backsliding. We must take a running start, so to speak, break with the old, and let it be known abroad that we are lined up with the new. But an exception in the beginning lets the nervous system slip back into its old adjustments. We must do or die, and that right early. And we must follow up our advantage with persistent practice, until it would be harder to go back to the old, neglected, obstructed way than to follow the new and open one. Our brain paths have taken a new direction.

As teachers, we must consider that few of our pupils can take this dashing initiative and form or reform themselves; they tend rather to respond, without much deliberation, to the suggestions of associates, especially superiors. It is all-important, in teaching an act of mental or muscular skill, that the teacher be able herself to perform it in true pattern style. Here is one of the reasons why the teacher's personality is the strongest (or weakest) moral influence in the school. If we want to make our pupils moral, we should do just as a great reformer does with the common people, mingle freely and tolerantly with them, but without sacrificing our ideals to their weaknesses. The teacher should exemplify strong, intelligent, gracious, persistent goodness.

Reformation.—A suggestion only can be offered here. An individual can be reformed by mid-level or high-level methods. The mid-level procedure cannot depend on the intelligent coöperation of the subject, but must work entirely from *without*, somewhat as one would train an animal. The evil practice, like an undesirable feeling, can be eliminated by (1) crushing it out, punishing it away by some kind of suffering associated directly with the offensive conduct; or (2) by keeping the attention elsewhere until the old habit dies out,—best of all, by replacing the bad act with a related good one. Let the boy who carves desk or walls work in the manual-training shop. The younger, or rather the more stupid the child, the more necessary is corporal punishment of some kind; the higher the development, the more can other deterrents be used. It is especially desirable to substitute moral flowers for weeds, good spirits for bad. To keep the soul empty of all evil, fill it with all good.

Where high-level methods can be used, the victory is eas-

ier. Even an unconscious bad practice may be raised to the level of consciousness and killed off by self-injunction. Pyle gives a case of a girl who thus broke herself of biting her lips, a habit that had existed from childhood. This was accomplished by *consciously* biting her lips and saying, "Now I must not bite my lips." *

Complete high-level reformation would involve (1) recognition of the evil committed, (2) the careful determination of what should and shall be done under such circumstances, and (3) the priming and setting of the mind in such a way as to make use of the right response the next time such a situation is confronted. Rugh offers the excellent suggestion that we require pupils under discipline to state these three points on paper. †

Community influence of the school.—The time will come when school buildings will be deliberately planned for community use and the teachers and other workers consciously organized for community service. The school must keep in touch morally with the adolescents who go out from it, often at the most critical age. The most important of all continuation schools is the school of morality. This moralizing influence must enter into the lives of adults in every effective way. But the time has come when we must stop bringing the duties and privileges of the home into the schoolroom; we must henceforth aim to build up good homes *at home*.

FOR FURTHER STUDY

1. Discuss the respective responsibilities of home and school in the teaching of morality.

* William Henry Pyle, *Educational Psychology* (1911), p. 157.

† Charles Edward Rugh, *Moral Training in the Public Schools*, pp. 47–49.

2. Write a brief account of your moral development, or some phase of it.

3. Outline an essay on "The school as a moral laboratory," in which good and bad are discovered and tried out by actual experience.

4. Does religion seem to you to be essential to morality? Why cannot the school teach religion?

5. Show that ethics is an approximate science.

6. Why should we not give to all the same punishment for "the same" offense?

7. What are the conditions that have led you to do your worst deeds? How can you guard against them?

8. Discuss the moral aspect of coeducation.

9. Do you think the team work, self-subordination, etc., of games and debates, are carried over to other activities? Give reasons.

10. Is there any such thing as formal discipline in the teaching of conduct? Prove your answer.

REFERENCES

Davenport, C. B., "Heredity, Culpability, Praiseworthiness, Punishment and Reward;" *Popular Science Monthly*, July, 1913.

Gould, F. J., *Moral Education.*

Hanus, Paul H., *Beginnings in Industrial Education*, Ch. VII.

La Rue, Daniel Wolford, "The Church and the Public School;" *Educational Review*, Vol. 37, No. 5.

Spiller, Gustav, *Report on Moral Instruction and on Moral Training in the Schools of Eighteen Countries.*

Moral Training in the Public Schools, California Prize Essays.

Papers on Moral Education, International Moral Education Congress.

CHAPTER XXVII

VOCATIONAL EDUCATION

"Each man has his own vocation. The talent is the call. There is one direction in which all space is open to him. He has faculties silently inviting him thither to endless exertion. He is like a ship in a river; he runs against obstructions on every side but one; on that side, all obstruction is taken away, and he sweeps serenely over God's depths into an infinite sea. This talent and this call depend on his organization, or the mode in which the general soul incarnates itself in him. He inclines to do something which is easy to him, and good when it is done, but which no other man can do. He has no rival. For the more truly he consults his own powers, the more difference will his work exhibit from the work of any other. When he is true and faithful, his ambition is exactly proportioned to his powers. The height of the pinnacle is determined by the breadth of the base. Every man has this call of the power to do somewhat unique, and no man has any other call. The pretense that he has another call, a summons by name and personal election and outward 'signs that make him extraordinary, and not in the roll of common men,' is fanaticism, and betrays obtuseness to perceive that there is one mind in all the individuals, and no respect of persons therein." *

EXERCISES.—Make a sizable list of your adult acquaintances, including various vocational types, from the professional to the day laborer. How many of them seem to you to be doing the work for which they are best fitted by natural ability? If possible, find out by conference with them how many chose their vocations deliberately and thoughtfully.

* Ralph Waldo Emerson, *Essay on Spiritual Laws.* Used by permission of Houghton Mifflin Company, publishers.

What constitutes the ideal vocation for any individual? How can he find out what it is?

The meaning of vocation.—We should go to the Latin root of this word to discover its finest educational meaning: *vocare* means to *call*. One's vocation is his calling, the call of heredity, of brain and blood, of instinct, of the best ability with which he is blest. A man's vocation is his work; his avocation is his play. "Vocation" should not be restricted to handwork or industrial pursuits, making vocational education mean merely the training of manual laborers. Vocation is *life purpose*, that for which one is born and for which he comes into the world; for every man's work is born with him. It is that pursuit, mental or manual, which becomes so dear that all distinction between work and play vanishes; we are ever at play at our work, and a busy life becomes a ceaseless vacation.

Two social extremes, tramps and the idle rich, foolishly doom themselves to a life of dull and incessant labor in the effort to do nothing continuously. But if there really are any vocationless individuals, they are like the useless zeros on the wrong side of the decimal point, negligible.

In a large sense, then, all studies are vocational studies, all education vocational education. The big things for us to accomplish for every child are (1) to discover, first in a general way and later more minutely and accurately, what kind of working force he is likely to be in the world, what vocation he should follow; and (2) to enable him to perform most effectively the service he is born to give.

The need for vocational education.—In American pedagogy it has become trite to point out that home and shop are not doing so much as they once did in the way of training our youth in various lines of apprenticeship. It is also

trite to state that a large proportion of our pupils leave school just as early as the law allows. But this combination of unhappy conditions is as evil as it is old.

The Massachusetts Commission on Industrial and Technical Education investigated three thousand families whose children had left school to work. Two thirds of these families were found able to have kept their children in school, and about two thirds of the children were found in industries of low grade. They had not learned a trade, but had shifted from one temporary job to another, arriving nowhere in particular.

It is evident that great social waste and great personal unhappiness must result from the fact that multitudes blunder into the wrong vocation, or none at all, and find themselves, in the most energetic years of young manhood or womanhood, hopelessly floundering when they ought to be prospering. As Parsons put it: "A man would not get good results by using his cow to draw his carriage and his horse for dairy purposes; yet the difference of adaptability in that case is no more emphatic than the differences in the aptitudes, capacities, powers, and adaptabilities of human beings.

"We guide our boys and girls to some extent through school, then drop them into this complex world to sink or swim as the case may be. Yet there is no part of life where the need for guidance is more emphatic than in the transition from school to work,—the choice of a vocation, adequate preparation for it, and the attainment of efficiency and success. The building of a career is quite as difficult a problem as the building of a house, yet few ever sit down with pencil and paper, with expert information and counsel, to plan a working career and deal with the life problem

scientifically, as they would deal with the problem of building a house, taking the advice of an architect to help them." *

Vocational guidance and vocational training.—To stop this personal ruin and social waste it is necessary (1) that each be placed at the post where he can serve most usefully and happily, and (2) that each shall receive such education as will render him efficient to the limit of his man power. If we had a small fighting force in a dangerous position, or a limited crew on a large vessel in a storm, we should appreciate most intensely this necessity for maximal individual service. Society is large; its needs are less evident; but they are no less real.

To steer each child ultimately into his own appropriate calling requires vocational *guidance;* to enable him to respond effectively to his call demands vocational *training*, or education. The first points him to the right road; the second furnishes him the means of travel. But guidance and training go on together; vocation-finding usually requires a certain amount of experimentation, of trial, rejection, acceptance. While the youth is learning *what* to do, he is also learning *how to do* it.

Demands of vocational guidance.—Vocational guidance requires (1) minute insight into the character and abilities of the candidate, (2) a broad outlook over the field of professions, occupations, "jobs," and (3) placement of the candidate (when prepared) in the most suitable position, with such after attention as may be required to insure permanence of placement, or to remedy occasional inevitable misplacements.

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* Frank Parsons, *Choosing a Vocation*, p. 4. Used by permission of Houghton Mifflin Company, publishers.

The first two requirements make our efforts seem hopeless. No way of making a complete inventory of a human personality has ever been discovered. While there are bookfuls of tests, and certain among us seem to take a torturer's delight in adding new ones to the medley, yet the number of such tests that have shown practical value is discouragingly small. Moreover, the most successful and valuable tests, such as those for sight and hearing and speed of movement, represent rather the simple, blunt procedure of plain common sense than the elaborate concoctions of intricate psychological science. Vocational counselors and others who must perform human analysis for practical and comprehensive purposes have not taken kindly to the complex psychological tests.

The second essential, that we take in the whole sweep of the possible vocations, halts our enthusiasm when we remember that there are more than nine thousand vocations in this country. Moreover, each of these callings must be analyzed into its elemental vocational requirements, that we may compare these with the abilities of the candidate and find whether he fits. Here is an analysis which may tax our powers as much as does that of the candidate.

Candidates for positions, or positions for candidates?— In the first place, as Ayres points out (in the article named in the References below), the selection of candidates for positions is much simpler than the selection of positions for candidates. In the first case we have to analyze the demands of one vocation only, instead of all vocations; and we test the individual for a few abilities only, those demanded by this particular business, instead of making an inventory of the whole range of his powers and aptitudes.

One of the most notable cases (quoted by Ayres) of find-

ing people for a position was the work of Mr. S. E. Thompson, who used reaction-time tests in selecting girls for the work of inspecting for flaws the steel balls used in ball bearings. This work required quick and keen perception, accompanied by quick, responsive action. Mr. Thompson measured the reaction time of all the girls and eliminated those who showed a long time between stimulus and reaction. The result was that thirty-five girls did the work formerly done by one hundred and twenty; the accuracy of the work was increased by 66 per cent; the wages of the girls were doubled, the working day decreased, and the profit of the factory increased.

But our task as teachers is more complex; we must not merely select a few for a special purpose, but we must guide every maturing young citizen into his best possible future. Here the suggestions of the practical vocational counselor have special value.

Parsons' method of studying candidates.—Parsons, the founder of vocational guidance, gives the following outline of his method.* It deals with the outlook on the vocational field, as well as with the study of the candidate.

I. Personal Data.

A careful statement, *on paper*, of the principal facts about the person, bringing out particularly every fact that has a bearing on the vocational problem.

II. Self-analysis.

A self-examination, *on paper*, done in private, under instructions of the counselor, developing specially every tendency and interest that should affect the choice of a life work.

III. The Person's own Choice and Decision.

In a great majority of cases this will show itself in a marked

* Frank Parsons, *Choosing a Vocation*, Ch. V. Used by permission of Houghton Mifflin Company, publishers.

degree before the work under I and II is finished. It must always be borne in mind that the choice of a vocation should be made by each person for himself rather than by anyone else for him. The counselor can only guide, correct, advise, assist the candidate in making his own final choice.

IV. Counselor's Analysis.

On the basis of the information obtained under I and II, so far as possible the counselor should test III by making an analysis under each of the following heads, seeking in every line for significance in the line of the main quest:

1. Heredity and circumstance.
2. Temperament and natural equipment.
3. Face and character.
4. Education and experience.
5. Dominant interests.

V. Outlook on the Vocational Field.

One who would be a vocational counselor should familiarize himself in a high degree with industrial knowledge, and he will need some knowledge, as we have indicated in Part Three of this book, that is not at present easily obtained. Investigations to be undertaken at once are:

1. Lists and classifications of industries and vocations.
2. The conditions of success in the various vocations.
3. General information about industries, up-to-date, the kind that is found in current magazines and papers rather than in books.
4. Apprenticeship systems now in practice.
5. Vocational schools and courses available in your city and state.
6. Employment agencies and opportunities.

VI. Induction and Advice.

This calls for clear thinking, logical reasoning, a careful, painstaking weighing of all the evidence, a broad-minded attitude toward the whole problem, tact, sympathy, wisdom.

VII. General Helpfulness in Fitting [the Candidate] into the Chosen Work.

Advantages of the school in vocational guidance.—Vocational service should be one of the chief aims of the school; and the school should be the chief instrument of vocational direction. The great advantage enjoyed by the school over all other vocational agencies is its long term of intimacy with the child. It need not resort to snapshot and cross-section methods, for under its kindly penetrating gaze the child works and plays for years, revealing his inmost nature freely and fully.

By increasing its working force somewhat, the school can learn the family history and the hereditary vocations, as one might almost call them; can see the panoramic perspective of ancestry. It can gather at first hand the significant facts of the child's development, note his successive vocational enthusiasms as they flame and fade, until at length comes the abiding desire for one pursuit.

One especial advantage is that in many, if not in most localities, our pupils can be brought into contact with numerous vocations, and can see their practitioners in action.

> "Why will a child desert his play
> The craftsman's work to see?
> Something within him, latent still,
> Stirs at each stroke of strength or skill,
> Whisp'ring, 'Work waits for me!'" *

It is profoundly meaningful when one kind of work attracts, while all others appear, in contrast, less desirable.

Finally, the school can judge of character, health, mental traits, general vocational bias, by actual trial. The *knowledge* side of many vocations is already in our curriculums, and *practice* is rapidly being added. Where electives are

* Froebel: Eliot's Translation.

permitted, and to some extent even where they are not, the school becomes a *vocational laboratory;* here the pupil can make his mistakes and get training in choice; it will prevent more costly blundering after school days are over.

The vocational counselor.—We cannot expect each teacher to know the whole vocational field. We can expect her to give valuable personal information, of the kind indicated above, concerning the pupils she teaches. For the rest we must depend on the vocational counselor, an officer who should be found in every school system. From him we can expect the broad social outlook, the knowledge of vocational conditions, the information concerning school courses and other means of preparation, which are essential to the placement of our young people.

The work as carried out in Boston.—Boston is the home of the pioneer vocational movement. The work, as carried on in the public schools of that city, includes the following:

1. Arousing general interest through lectures, literature, etc.

2. A vocational counselor, or committee of them, for each school.

3. A vocational card record of each elementary school graduate, which is sent to the high school at the time of such graduate's entrance there.

4. Vocational lectures before classes about to graduate from the elementary school, followed by talks given by the teachers.

5. Philanthropic individuals and societies interested.

6. Vocational libraries established in the schools.

The three aims kept most prominently in mind are (1) to make parents, pupils, and teachers all realize the impor-

tance of the life-career motive; (2) to place every pupil, when he leaves school, in some remunerative position; and (3) to keep in touch with those who are placed, suggesting means of improvement and ways of advancement.

Mass meetings are held, and the vocational counselors form a working organization. Handbooks are issued, giving the main facts about various vocations. A special course has been established for the training of counselors.

But all of these measures are for the benefit of the boys mainly. The Girls' Trade Educational League cares for the interests of the girls, and the Women's Educational and Industrial Union conducts an appointment bureau for women. Another organization, the Home and School Association, makes a special effort to interest and enlighten parents along these lines. The city of Boston also conducts a municipal employment bureau.

FOR FURTHER STUDY

1. Tabulate the qualities which seem to you to be necessary in all vocations.

2. Which do you think is more trustworthy, one's opinion about himself, or the estimate of others concerning him? Why? Does anything depend on the person?

3. List the advantages and the dangers of following the vocation of one's father.

4. If possible, have a psychologist give you a number of laboratory tests. Do you find that they teach you anything of importance which you did not know before concerning yourself?

5. Do you know what a close scrutiny of the educational field reveals as to the possibilities in teaching? Is the profession overcrowded? Are salaries likely to go up or down? What are the opportunities for really large service?

6. Do you know how much better your opportunities will be if you specialize in some particular line of teaching? How can you find out?

7. Discuss matrimony as a vocation for women. Are all fit for it?

8. What is the relation of correct vocational placement to morality? To social unrest?

9. When all have become skilled in some vocation, how will "unskilled labor" be disposed of? What influence are inventions likely to have on this problem?

REFERENCES

Ayres, Leonard P., "Psychological Tests in Vocational Guidance;" *Journal of Educational Psychology*, Vol. IV, No. 4 (April, 1913).

Bloomfield, Meyer, *The Vocational Guidance of Youth.*

Brewer, John M., and Kelly, Roy William, *A Selected Critical Bibliography of Vocational Guidance.*

Eliot, Charles William, *The Value, during Education, of the Life-career Motive.* Proceedings of N. E. A., 1910.

———, *Education for Efficiency.*

Parsons, Frank, *Choosing a Vocation.*

Snedden, David, *The Problem of Vocational Education.*

Bulletins of the Girls' Trade Educational League, Boston.

Vocational Education. (Published bi-monthly at Peoria, Ill.)

Vocations for Boys, Vocation Bureau, Boston.

BIBLIOGRAPHY

Angell, James Rowland, *Chapters from Modern Psychology.* Longmans, Green and Company.

Bagley, William Chandler, *Classroom Management.* The Macmillan Company.

Bagley, William Chandler, *The Educative Process.* The Macmillan Company.

Ball, W. W. Rouse, *A Short Account of the History of Mathematics.* The Macmillan Company.

Bancroft, Jessie Hubbell, *School Gymnastics.* D. C. Heath and Company.

Barnes, Mary Sheldon, *Studies in Historical Method.* D. C. Heath and Company.

Betts, George Herbert, *The Mind and Its Education.* D. Appleton and Company.

Binet, Alfred, *Les idêes modernes sur les enfants.* Felix Alcan.

Bloomfield, Meyer, *The Vocational Guidance of Youth.* Houghton Mifflin Company.

Bolton, Frederick Elmer, *Principles of Education.* Charles Scribner's Sons.

Book, William Frederick, *The Psychology of Skill.* University of Montana.

Boone, Richard Gause, *Science of Education.* Charles Scribner's Sons.

Bourne, Henry E., *Teaching of History and Civics.* Longmans, Green and Company.

Carpenter, G. R., Baker, F. T., and Scott, F. N., *Teaching of English.* Longmans, Green and Company.

Charters, W. W., *Methods of Teaching.* Row, Peterson and Company.

Colvin, S. S., and Bagley, W. C., *Human Behavior.* The Macmillan Company.

Courtis, S. A., *Courtis Tests in Arithmetic.* (Obtained from the author, 82 Eliot St., Detroit, Mich.)

Crane, Walter, *Arts and Crafts Essays.* Longmans, Green and Company.

Davis, William Morris, *Geographical Essays.* Ginn and Company.

Dearborn, Walter Fenno, *School and University Grades.* Bulletin No. 368, University of Wisconsin.

Dewey, John, *Ethical Principles Underlying Education.* University of Chicago Press.

Dewey, John, *How We Think.* D. C. Heath and Company.

Dewey, John, *My Pedagogic Creed.* A. Flanagan Company.

Dexter, T. F. G., and Garlick, A. H., *Psychology in the Schoolroom.* Longmans, Green and Company.

Dodge, Richard Elwood, and Kirchwey, Clara Barbara, *The Teaching of Geography in Elementary Schools.* Rand, McNally and Company.

Earhart, Lida B., *Teaching Children to Study.* Houghton Mifflin Company.

Eliot, Charles William, *Educational Reform.* The Century Company.

Eliot, Charles William, *Education for Efficiency.* Houghton Mifflin Company.

Emerson, Ralph Waldo. *Essays.* Houghton Mifflin Company.

Fitch, J. G., *The Art of Questioning.* A. Flanagan Company.

Galton, Francis, *Inquiries into Human Faculty.* E. P. Dutton and Company.

Geikie, Archibald, *The Teaching of Geography.* The Macmillan Company.

Gilbert, Charles B., *What Children Study and Why.* Silver, Burdett and Company.

Gordy, J. P., *A Broader Elementary Education.* Hinds, Hayden and Eldridge.

Gulick, Luther Halsey, *Physical Education by Muscular Exercise.* P. Blakiston's Son and Company.

Hall, G. Stanley, *Adolescence.* D. Appleton and Company.

Hall, G. Stanley, *Aspects of Child Life and Education.* Ginn and Company.

Hall, G. Stanley, *Youth: Its Education, Regimen, and Hygiene.* D. Appleton and Company.

Hamilton, Samuel, *The Recitation.* J. B. Lippincott Company.

Hanus, Paul H., *Beginnings in Industrial Education.* Houghton Mifflin Company.

Hanus, Paul H., *Educational Aims and Educational Values.* The Macmillan Company.

Hanus, Paul H., *Geometry in the Grammar School.* D. C. Heath and Company.

Hinsdale, B. A., *How to Study and Teach History.* D. Appleton and Company.

Hinsdale, B. A., *Teaching the Language Arts.* D. Appleton and Company.

Hinsdale, B. A., *The Art of Study.* American Book Company.

Horne, Herman Harrell, *Psychological Principles of Education.* The Macmillan Company.

Hunt, E., *Concrete Geometry for Grammar Schools.* D. C. Heath and Company.

Hunt, Una, *Una Mary: The Inner Life of a Child.* Charles Scribner's Sons.

Huxley, Thomas Henry, *Science and Education.* D. Appleton and Company.

James, William, *Principles of Psychology.* Henry Holt and Company.

James, William, *Talks to Teachers.* Henry Holt and Company.

Jevons, W. Stanley, *Elementary Lessons in Logic.* The Macmillan Company.

Johnson, George Ellsworth, *Education by Plays and Games.* Ginn and Company.

Klapper, Paul, *Principles of Educational Practice.* D. Appleton and Company.

Langlois, Ch. V., and Seignobos, Ch., *Introduction to the Study of History.* (Translated by G. G. Berry.) Henry Holt and Company.

Lincoln, Lillian I., *Everyday Pedagogy.* Ginn and Company.

McCurdy, James Huff, *Bibliography of Physical Training.* G. E. Stechert and Company.

McMurry, Charles A., *Special Method in Elementary Science.* The Macmillan Company.

McMurry, F. M., *How to Study.* Houghton Mifflin Company.

Mero, Everett B., *American Playgrounds.* Baker and Taylor Company.

Mill, John Stuart, *A System of Logic.* Harper and Brothers.

Mosso, Angelo, *Psychic Processes and Muscular Exercise.* Clark University Decennial Celebration Volume, 1899.

Munroe, Paul, *Cyclopedia of Education.* The Macmillan Company.

O'Shea, M. V., *Education as Adjustment.* Longmans, Green and Company.

Palmer, George Herbert, *Self-cultivation in English.* T. Y. Crowell and Company.

Parker, Francis W., *How to Study Geography.* D. Appleton and Company.

Parker, Samuel Chester, *Methods of Teaching in High Schools.* Ginn and Company.

Parsons, Frank, *Choosing a Vocation.* Houghton Mifflin Company.

Pyle, William Henry, *Outlines of Educational Psychology.* Warwick and York.

Rapeer, Louis W. (Editor), *Educational Hygiene.* Charles Scribner's Sons.

Read, Melbourne Stuart, *An Introductory Psychology.* Ginn and Company.

Rugh, Charles Edward, *Moral Training in the Public Schools.* Ginn and Company.

Rusk, Robert R., *Introduction to Experimental Education.* Longmans, Green and Company.

Sargent, Dudley A., *Health, Strength, and Power.* H. M. Caldwell Company.

Sargent, Dudley A., *Physical Education.* Ginn and Company.

Schaeffer, Nathan C., *Thinking and Learning to Think.* J. B. Lippincott Company.

Schmucker, Samuel Christian, *The Study of Nature*. J. B. Lippincott Company.

Scott, Colin A., *Social Education*. Ginn and Company.

Smith, David Eugene, *The Teaching of Elementary Mathematics*. The Macmillan Company.

Snedden, David, *The Problem of Vocational Education*. Houghton Mifflin Company.

Spencer, Herbert, *Education*. D. Appleton and Company.

Spiller, Gustav, *Report on Moral Instruction and on Moral Training in the Schools of Eighteen Centuries*.

Stoner, Winifred Sackville, *Natural Education*. Bobbs-Merrill Company.

Strayer, George Drayton, *Brief Course in the Teaching Process*. The Macmillan Company.

Suzzalo, Henry, *The Teaching of Primary Arithmetic*. Teachers College.

Swift, E. J. *Mind in the Making*. Charles Scribner's Sons.

Thorndike, Edward L., *Education*. The Macmillan Company.

Thorndike, Edward L., *Educational Psychology*. Teachers College.

Thorndike, Edward L., *Mental and Social Measurements*. Teachers College.

Thorndike, Edward L., *Principles of Teaching*. A. G. Seiler.

Titchener, Edward Bradford, *Lectures on the Elementary Psychology of Feeling and Attention*. The Macmillan Company.

Titchener, Edward Bradford, *Primer of Psychology*. The Macmillan Company.

Tompkins, Arnold, *Science of Discourse*. Ginn and Company.

Tracy, Frederick, and Stimfl, Joseph, *The Psychology of Childhood.* D. C. Heath and Company.

Whipple, Guy Montrose, *Manual of Mental and Physical Tests.* Warwick and York.

White, Emerson E., *Examinations and Promotions in Graded Schools.* Government Printing Office, Washington, D. C.

White, Emerson E., *The Art of Teaching.* American Book Company.

Yerkes, Robert M., *Introduction to Psychology.* Henry Holt and Company.

Young, J. W. A., *The Teaching of Mathematics in the Elementary School and the Secondary School.* Longmans, Green and Company.

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